

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

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XX.—MANDURO: A NEW OIL-YIELDING TREE FROM
PORTUGUESE EAST AFRICA.

(*Balanites Maughamii*, Sprague.)

T. A. SPRAGUE.

In November, 1911, leafy branches of a species of *Balanites* (Simarubaceae*) were received at Kew from Mr. R. C. F. Maugham, H.M. Consul at Lourenço Marques, accompanied by a letter from which the following paragraphs are extracted.

"I beg to enclose under separate cover some twigs and foliage of a tree growing in some profusion in this district, which, it has been found, produces a fruit the kernel of which is highly oleaginous, and yields not less than 60 per cent. of a fine oil perfectly suitable for alimentary, lubricating or manufacturing purposes."

"I regret I have no nuts remaining, but I have sent small quantities both to the Imperial Institute and the Commercial Intelligence Department of the Board of Trade."

The material received from Mr. Maugham was identified as an undescribed species of *Balanites* agreeing with a specimen in the Kew Herbarium collected at the Rovuma River by Dr. (now Sir John) Kirk, and mentioned by Oliver, Fl. Trop. Afr. vol. i. p. 315, under *Balanites aegyptiaca*, as possibly belonging to a distinct species.

The following additional information regarding the tree was contained in an official report dated 25th Oct., 1911, from Mr. Maugham, a copy of which was transmitted to Kew.

"A discovery of some value has been recently made in this district by a Portuguese gentleman named Ferreira Leao. This discovery takes the form of a large hitherto unidentified tree growing plentifully, it is said, in the neighbouring Lebombo Mountains, and elsewhere near at hand. The growth in question produces a nut or

* Some botanists have referred the genus to the Zygophyllaceae, whilst others have made it the type of a special family, the Balanitaceae or Agialidaceae.

almond which contains some 60 per cent. of clear oil similar to finest olive oil and burning with a bright flame.

"No intelligible name can be given to the tree in question, which is described as reaching a height of from 45 to 60 feet and producing annually an average of 1,200 lbs.* of nuts. It yields after four years and grows rapidly even in dry sandy soil."

Specimens of the fruits were received subsequently at Kew from the Commercial Intelligence Branch of the Board of Trade and the Imperial Institute, with the information that the tree bearing them grew in large numbers in the Lebombo Mountains and on the banks of the Umbeluzi River.

The new *Balanites* could be distinguished from all previously described species except *B. Wilsoniana*, Dawe & Sprague, by bearing curious forked spines, and from *B. Wilsoniana* by its much smaller fruits.

In the absence of flowers, an adequate technical description could not be drawn up, and Mr. Maugham was accordingly requested to procure flowering specimens of the tree, if possible. Shortly afterwards, however, good flowering material, together with fruits and a barren shoot, was received from Mr. M. T. Dawe, Director of Agriculture, Companhia de Moçambique, Beira; and a full description of the species is given below under the name *Balanites Maughamii*. Mr. Dawe sent at the same time specimens of a second new species, closely allied to *B. Maughamii*, but differing in the shape of the petals and the elongated fruits. For this the name *B. Darvei* is proposed.

HISTORY OF THE GENUS *BALANITES*.

In order that the relationships of the two proposed new species may be understood, it will be necessary to give some account of those previously described.

The first species known was *Balanites aegyptiaca*, which has been cultivated in Egypt for more than four thousand years. Stones of *B. aegyptiaca* have been found in tombs of the twelfth dynasty. These were placed there as votive offerings, the edible pulp having previously been removed. Schweinfurth states that the ancient Egyptians frequently offered to the dead merely the stones of fruits of which they had already eaten the edible part. (Ber. Deutsch. Bot. Ges. vol. ii. 1884, p. 362; Egyptian Gazette, Jan. 31, 1884.)

B. aegyptiaca was described and figured in 1592 by Prosper Alpinus, under the name Agihalid (De Pl. Aegypt. Liber, p. 16). The leaves and spines are evidently intended for those of *B. aegyptiaca*, but the flowers and fruits belong to a species of *Lycium*. The name 'Agihalid' is a corruption of the Arabic 'Heglig' (Delile, Fl. d'Égypte, p. 77).

Linnaeus included Agihalid in the genus *Ximenia* as a second species, *X. aegyptiaca*, differing from *X. americana* in having 'geminate leaves' (Sp. Pl. 1753, p. 1194).

Adanson recognized that Agihalid was generically distinct from *Ximenia*, and proposed the new genus *Agialid* to accommodate it (Fam. Pl. 1763, vol. ii. p. 508). He was the first to publish a correct

* This amount was subsequently corrected to 40-50 lbs. of nuts (Dipl. and Cons. Rep., Ann. Ser., No. 4881, 1912, p. 7).

description of the fruit of *Balanites* (*Agialid*), and there can be little doubt that his description was drawn up from a specimen which he himself had collected in Senegal in 1750, and identified with *Agialid* of Prosper Alpinus. This specimen is the type of *Agialida senegalensis*, Van Tiegh. (Ann. Sc. Nat. ser. 9, vol. iv. p. 232).

Though *Agialid*, Adans., is the earliest name for the genus under consideration, it does not seem to have been adopted by other botanists until 1891, when Kuntze revived it in the modified form *Agialida* (Rev. Gen. vol. i. p. 103). The name *Agialid* was used by Hiern in 1896 (Cat. Welw. Afr. Pl. vol. i. p. 119) and the form *Agialida* by Van Tieghem in 1906 (Ann. Sc. Nat. ser. 9, vol. iv. p. 223). Most botanists, however, prefer to adopt the later generic name *Balanites*, which was accompanied by an excellent description and figure, and has now been in use for a century (Rep. Bot. Congr. Vienna, 1905, p. 245).

The genus *Balanites* was founded in 1813 by Delile on *Ximenia aegyptiaca*, Linn. (Fl. d'Égypte, p. 77, t. 28.) Delile evidently did not consider Adanson's generic name valid, as he quoted it in synonymy. His generic and specific descriptions are very accurate, and are followed by a valuable historical account of *B. aegyptiaca*.

An early description of *B. aegyptiaca* may be mentioned here. In 1704 a botanist named Augustin Lippi, to whom the genus *Lippia* was dedicated, travelled in Egypt, and his results were recorded in a manuscript volume entitled 'Description des plantes observées en Égypte par M. Lippi en 1704' (Pritzel, Thesaurus, ed. 2, p. 193). This work, which was never published, included a description of *B. aegyptiaca* from which the following particulars were extracted by A. L. de Jussieu in 1804 (Dict. Sc. Nat. vol. i. p. 297).

"Les fleurs . . . ont selon Lippi, un calice à cinq divisions profondes, cinq pétales, dix étamines, un germe supérieur surmonté d'une style et d'une stigmat, une baie contenant une noix pentagone et monosperme. Son fruit est purgatif, au rapport de Lippi qui ajoute que cet arbre n'est abondant que dans le royaume de Sennaar."

Balanites aegyptiaca is confined to Tropical Africa, Arabia, Egypt and Palestine.

A second species of *Balanites* was described in 1854 by Planchon, who pointed out that the Indian plant described by Roxburgh under the name *Ximenia aegyptiaca* (Fl. Ind. ed. Carey, vol. ii. p. 253) differed from the African in the petals being villous on the upper surface; and he accordingly regarded it as a new species, *B. Roxburghii* (Ann. Sc. Nat. ser. 4, vol. ii. p. 258).

In 1868 Oliver described a new variety of *B. aegyptiaca* from Angola, under the name var. *angolensis*, Welw. He remarked that "the fruit of this variety differs so remarkably from that of the ordinary form, that this plant may probably be specifically distinct."

A. W. Bennett in 1875 kept *B. Roxburghii* separate from *B. aegyptiaca*, but remarked that it was very nearly allied to, and perhaps only a variety of that species (Fl. Brit. Ind. vol. i. p. 522).

In 1896 Engler recognised only a single species of *Balanites*, extending from Senegambia to Burma (Engler & Prantl, Nat. Pflanzenfam. vol. iii. 4, p. 355).

In 1906 Van Tieghem, on the other hand, divided *Balanites* into 3 genera, comprising altogether 22 species. The three genera were *Agialida*, founded on *Ximenia aegyptiaca*; *Agiella*, founded on *Balanites aegyptiaca* var. *angolensis*; and *Balanites*, which Van Tieghem restricted to *B. Roxburghii* and its allies, although the type species of Delile's genus *Balanites* was *B. aegyptiaca*. The three genera were distinguished as follows:—

Petals glabrous on their upper surface:—

Ovary hairy	<i>Agialida</i> .
Ovary glabrous	<i>Agiella</i> .
Petals hairy on their upper surface	<i>Balanites</i> .

REVISION OF THE SERIES ROXBURGHIANAE.

In the writer's opinion the characters mentioned are hardly of sufficient importance to justify the creation of new genera, but there can be no question that they are extremely useful for distinguishing groups of species. It is therefore proposed to recognize three series of species in *Balanites*, corresponding to Van Tieghem's three genera. Van Tieghem's generic names are unfortunately inapplicable, as two of them, according to the view here adopted, apply to the whole genus. The series are therefore named in each case after the type species; *Aegyptiacae* corresponding to *Agialida*; *Angolenses* to *Agiella*; and *Roxburghianae* to *Balanites*. The three groups have been styled 'series' instead of 'sections,' as it is doubtful in the present state of our knowledge whether they constitute natural groups.

The present investigation may be limited to the series *Roxburghianae*, as both *B. Maughamii* and *B. Dawei* have petals hairy on the upper surface, and are therefore assignable to that group. The previously described species belonging to the *Roxburghianae* are: *B. Roxburghii*, Planch., *B. Jacquemonti*, Van Tiegh., *B. indica*, Van Tiegh., *B. triflora*, Van Tiegh., *B. Wilsoniana*, Dawe & Sprague, and *B. Tieghemi*, A. Chevalier.

Balanites Jacquemonti, Van Tiegh., and *B. indica*, Van Tiegh., appear to be reducible to *B. Roxburghii*, Planch., the distinguishing characters mentioned by Van Tieghem being such as might be met with on branches of different age and at different seasons of the year. To give a single example, the leaves of *B. Roxburghii* described by Van Tieghem are old leaves of the spiny long-shoots; those of *B. Jacquemonti* are young leaves of the short-shoots; whilst those of *B. indica* are old leaves of the short-shoots.

Balanites triflora, Van Tiegh., appears, however, to differ specifically from *B. Roxburghii*, although the character of the three-flowered cymes given by the author does not hold good. In *B. Roxburghii* the spines are strong and well-developed, and the short-shoots bearing the cymes are either cushion-like, or if they grow out, rarely exceed two inches in length. In *B. triflora*, on the other hand, the spines are short and slender, $\frac{1}{8}$ – $\frac{1}{2}$ in. long, and the flowering shoots may attain a length of 6–8 inches. Even when it is borne in mind that fully grown trees of *B. Roxburghii* are often unarmed (Beddome, *Flora Sylvatica*, vol. ii. p. 1.), the differences between *B. Roxburghii* and *B. triflora* seem sufficient to justify the retention of the latter as an independent species.

It is much to be desired, however, that full material of each species illustrating the various stages of development from the production of the new leafy shoots to the time of the maturation of the fruit should be gathered from single trees. Until this is done, a satisfactory comparison of *B. Roxburghii* and *B. triflora* cannot be made.

Balanites Roxburghii, as here understood, is confined to India proper, and *B. triflora* to Upper Burma. *B. triflora* was first gathered by Griffith at Sheemnaga Pagoda near Ava in May, 1837, and subsequently by Smales at Yeu in May, 1900. Griffith refers to it as "a curious Rutaceous-looking decandrous thorny tree" (Journals, p. 106). Both specimens bear flowering shoots.

The species of the series *Roxburghianae* may now be distinguished as follows:—

Spines present; fruits not cylindric-clavate:—

Spines either unbranched, or the lateral branches much shorter than the main spine:—

Spines $\frac{1}{2}$ –3 in. long; cymes borne on short-shoots which are either much contracted and cushion-like, or, if elongated, do not exceed $2\frac{1}{4}$ in. in length

1. *B. Roxburghii*.

Spines $\frac{1}{8}$ – $\frac{1}{2}$ in. long; cymes borne on shoots which may attain 6–8 in. in length 2. *B. triflora*.

Spines bifurcate owing to the vigorous growth of a lateral branch which often nearly equals the upper part of the main spine and pushes it more or less on one side:—

Fruits ellipsoid or ovoid, 4–4 $\frac{3}{4}$ in. long:—

Fruit ellipsoid, 4 $\frac{1}{2}$ in. long, 3 in. in diameter, deeply 5-grooved; seed 1 $\frac{3}{4}$ in. long 3. *B. Wilsoniana*.

Fruit ovoid, 4–4 $\frac{3}{4}$ in. long, 2 $\frac{1}{4}$ –2 $\frac{3}{4}$ in. in diameter; seed 3 in. long 4. *B. Tieghemii*.

Fruits oblong-ellipsoid, 1 $\frac{1}{2}$ –1 $\frac{3}{4}$ in. long 5. *B. Maughamii*.

Spines absent; fruits cylindric-clavate or subcylindric, 2 $\frac{1}{2}$ –3 in. long 6. *B. Dawei*.

1. *B. Roxburghii*, *Planch.* in *Ann. Sc. Nat.* ser. 4, vol. ii. p. 258; *Brandis*, *For. Fl.* p. 59; *A. W. Bennett* in *Fl. Brit. Ind.* vol. i. p. 522; *Watt*, *Dict. Econ. Prod.* vol. i. p. 363; *Prain*, *Bengal Plants*, vol. i. p. 308; *Cooke*, *Fl. Bombay*, vol. i. p. 195; *Talbot*, *For. Fl. Bombay*, vol. i. p. 210; *Brandis*, *Indian Trees*, p. 124, excluding the locality Burma. *B. aegyptiaca*, var. *Roxburghii*, *Duthie*, *Fl. Upper Gangetic Plain*, vol. i. p. 145. *Ximenia aegyptiaca*, *Roxb.*, *Fl. Ind.* ed. *Carey*, vol. ii. p. 253, non *Linn.* *Balanites aegyptiaca*, *Wall.* *Cat.* 6855; *Royle*, *Ill.* p. 154; *Wight*, *Ic.* vol. i. t. 274; *Beddome*, *Fl. Sylv.* vol. ii. p. 1, *Anal. gen.* t. 8, fig. 2; non *Delile*.

CENTRAL AND SOUTH INDIA, SIKKIM, BEHAR.

2. *B. triflora*, *Van Tiegh.* in *Ann. Sc. Nat.* ser. 9, vol. iv. p. 253.

UPPER BURMA. Near Ava, *Griffith*. *Yeu*, *Smales*.

Kurz, *For. Fl. Brit. Burma*, vol. i. p. 204, records *B. Roxburghii* from "the dry forests of Prome and Ava." His description appears to have been drawn up partly from specimens of *B. Roxburghii* and partly from *B. triflora*.

3. *B. Wilsoniana*, *Dawe et Sprague* in Journ. Linn. Soc., Bot., vol. xxxvii. p. 506; *Mildbraed* in Wiss. Ergebn. Deutsch. Zentr.-Afr.-Exped. 1907—1908, vol. ii. p. 422, t. 47.

UGANDA. Kibale Forest, *Dawe*, 511; also found by Mr. *Dawe* in the Unyoro and Semliki Forests. Native name "Lukaayu." CONGO STATE. Stanleyville District: between Beni and Muera, *Mildbraed*, 2352; also observed by Dr. *Mildbraed* at Kifuku (near Irumu) on the upper Irumu River.

B. Wilsoniana was originally described from fruiting material, the flowers being unknown. The very clear figure given by Dr. *Mildbraed* represents the petals as villous on the upper surface, and the species is accordingly placed in the series *Roxburghianae*.

4. *B. Tieghemii*, *A. Chevalier* in Bull. Soc. Bot. France, vol. lviii. Mém. 8, p. 145.

IVORY COAST. Indénié, between Diambarakrou and Borobo, *Chevalier*, 17,741. Basin of the Sassandra, between Soubré and Guidéko, *Chevalier*, 17,992.

Evidently very closely allied to *B. Wilsoniana*, and therefore placed provisionally in the series *Roxburghianae*, although the flowers are not known.

5. *B. Maughamii*, *Sprague*, n. sp.*

Tree up to 50 ft. high; bole irregularly shaped, up to $1\frac{3}{4}$ ft. in diameter. Shoots of two kinds, some barren and spiny, others flower-bearing and unarmed or nearly so. Barren shoots zigzag, green and pubescent in the first year, bearing forked spines above the axils, becoming more or less glabrous and blotched in their second year, and bearing leafy cushion-like short-shoots, lenticellate in their third year. Leaves of the first year: Petioles $\frac{1}{4}$ –1 in. long, rather densely pubescent; leaflets elliptic-ovate, acute at the apex, unequally rounded at the base, or obtuse on the upper side, rounded on the lower, $1\frac{1}{2}$ – $3\frac{1}{2}$ in. long, 1 – $2\frac{1}{2}$ in. broad, thinly coriaceous, glabrescent on both surfaces except the midrib, which is pubescent; stipules subulate, $\frac{1}{2}$ lin. long. Leaves of the short-shoots: Petioles $\frac{1}{6}$ – $\frac{1}{4}$ in. long; leaflets elliptic or ovate-elliptic, rounded or obtuse at the apex, rounded at the base on the lower side, obtuse on the upper, $1\frac{1}{4}$ – $1\frac{1}{2}$ in. long, $\frac{3}{4}$ – $1\frac{1}{4}$ in. broad. Spines up to $2\frac{3}{4}$ in. long, usually with a single branch nearly equalling the upper part of the main spine. Flower-bearing shoots 1–6 in. long, bearing 9 leaves or fewer, densely greenish-pubescent. Leaves of the flower-bearing shoots (only seen in a relatively young state) densely greenish-pubescent; petioles up to 1 in. long; leaflets broadly ovate or elliptic, obtuse or rounded at the apex, rounded at the base, the base of the blade on the upper side being $\frac{1}{2}$ –2 lin. above the base on the lower side, $1\frac{1}{2}$ – $1\frac{3}{4}$ in. long, $1\frac{1}{4}$ – $1\frac{1}{2}$ in. broad, paler and more densely pubescent on the lower surface. Cymes umbel-like, usually 2 in each axil, one above the other, sometimes solitary, the upper or solitary ones

* It has been thought desirable to supply English descriptions of the two new species on account of the economic interest attached to them. Latin descriptions are given at the end of the article.

3-5-flowered, the lower 1-3-flowered. *Sepals* densely greenish-pubescent outside, whitish-silky inside. *Petals* apparently greenish, lanceolate when flattened out to their full length, $\frac{1}{4}$ in. long, whitish-villous on the upper surface except the uppermost $\frac{1}{2}$ - $\frac{3}{4}$ lin., which is glabrous and much crumpled. *Filaments* $1\frac{1}{4}$ - $1\frac{1}{2}$ lin. long. *Ovary* very densely covered with dirty greenish-white hairs. *Drupe* oblong-ellipsoid, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. long, 1 in. in diameter or rather more, with a deep basal depression and a smaller apical one at the bottoms of which are the scars left by the pedicel and style respectively, longitudinally 5-grooved in the upper part; epicarp crustaceous; mesocarp fibrous and spongy; endocarp woody, $1\frac{1}{2}$ -2 lin. thick. *Seed-coat* buff-coloured. *Embryo* oblong-ellipsoid, about 1 in. long, strongly grooved.

PORTUGUESE EAST AFRICA. Lebombo Mountains, and by the Umbeluzi River, *Maugham*. By the Rovuma River, *Kirk*. Madanda Forest, *Dawe*, 428.

According to Mr. Dawe, *B. Maughamii* is known in the Madanda Forest by the native name "Manduro."

The tree figured by Sim, For. Fl. Port. E. Afr. t. 56, as "*Trachylobium mozambicensis*" is apparently *Balanites Maughamii*. The description (p. 51) contains a mixture of characters, some derived from the *Balanites* figured by Mr. Sim, and others copied from the descriptions of the genus *Trachylobium* and of *T. Horne-mannianum* given in Fl. Trop. Afr. vol. ii. p. 311. The floral characters given by Sim, and the statement that the fruit is 1-2-seeded, apply to the *Trachylobium*.

According to Sim's figure and description, the spines are "either simple or more frequently 2-spined (apparently dichotomous), or sometimes several-spined."

Sim states that the tree has a valuable hard timber, and that it is frequent in the extratropical districts, and present but less common in the northern districts. Judging from the localities where it is known to occur, *B. Maughamii* might be expected to do well in tropical and subtropical countries with a well-marked dry season. It would not be advisable to plant it on a large scale, however, until a satisfactory method of extracting the kernels has been devised (see p. 138).

6. *B. Dawei*, *Sprague*, n. sp. Shoots unarmed, of two kinds, some barren, others flower-bearing. Barren shoots straight, rather stout and densely greenish-white-pubescent in the first year, bearing 3 buds above the axils, one above the other, subsequent years growth not known. Leaves of the first year (only seen in a relatively young state): Petioles $\frac{3}{4}$ - $1\frac{1}{4}$ in. long; leaflets broadly ovate, apiculate from a rounded, truncate or retuse apex, rounded at the base, the base of the blade on the upper side being about $1\frac{1}{2}$ lin. above the base on the lower side, $2\frac{1}{2}$ -3 in. long, 2- $2\frac{1}{2}$ in. broad, thinly herbaceous, distinctly different in colour on the upper and lower surfaces, puberulous on the upper, densely greenish-white-pubescent on the lower; stipules narrowly triangular, 1- $1\frac{1}{2}$ lin. long, tomentellous. Flower-bearing shoots 1-6 in. long, bearing 6 leaves or fewer, densely greenish-white-pubescent. Leaves of the flower-bearing shoots like those of the barren shoots, but rather smaller, glabrescent on the

upper surface, the upper ones sometimes acute at the apex. *Cymes* solitary or 2 in each axil, one above the other, the upper or solitary ones simple, 3-7-flowered, or racemosely branched up to 12-flowered, the lower cymes 1-3-flowered. *Petals* oblanceolate when flattened out to their full length, about $\frac{1}{3}$ in. long, crumpled tip hardly 1 lin. long. *Filaments* $1\frac{1}{2}$ lin. long. *Ovary* very densely covered with whitish hairs. *Drupe* cylindric-clavate, $2\frac{1}{2}$ -3 in. long, with a slight basal depression, and no apical one or hardly any, longitudinally 5-grooved from apex to base. *Embryo* clavate, $1\frac{1}{4}$ in. long, acute at the base.

PORTUGUESE EAST AFRICA. Madanda Forest, *Dawe*, 435.

ECONOMIC VALUE OF THE TWO NEW SPECIES.

Fruits of *Balanites Maughamii* have been examined recently at the Imperial Institute, and the results obtained for that species will no doubt apply also to *B. Dawei*, which is very closely allied (Bull. Imp. Inst. 1912, vol. x. pp. 548-9).

According to the report, it seems unlikely that the fruits of *B. Maughamii* can be of economic value for export, owing to the difficulty, first, of removing the external sugary pulp, and then of extracting the kernel from the thick fibrous shell in which it is enclosed.

The sample was too small to enable the percentage of oil in the kernels to be determined. The specimen of oil was clear, yellow and liquid, possessing no marked smell or taste. The constants of the oil are as follows:—

Specific gravity 0.916; saponification value 198.5; iodine value 100.

The oil resembles that of *B. aegyptiaca* in appearance and general character, and if produced on a commercial scale it would probably realise the current price of refined cotton-seed oil, but it is thought, that the difficulties mentioned above would prevent its production on a large scale.

It may nevertheless be of considerable importance for local consumption. A detailed account of the uses of *B. aegyptiaca* is given in Kew Bull., Add. Ser. vol. ix. pp. 138-139. Much of the information there given will no doubt apply also to *B. Maughamii*.

SPECIERUM NOVARUM DESCRIPTIONES.

Balanites Maughamii, *Sprague*; affinis *B. Roxburghii*, Planch., et *B. triflorae*, Van Tiegh.; ab illa ramulis floriferis foliatis hornotinis bene evolutis e ramis annotinis inermibus vel subinermibus ortis; ab hac petalis lanceolatis multo latioribus villosioribus, antheris duplo longioribus; ab ambabus ramis annotinis fusco-maculatis, foliolis majoribus basi inaequalite rotundatis distinguitur.

Arbor usque ad 15 m. alta, trunco irregulari usque ad 0.5 m. diametro. *Rami* alteri steriles, spiniferi, alteri fertiles, inermes vel subinermes. *Rami steriles* anfractuosi, anno primo virides, pubescentes, spinas bifurcatas (rarius simplices) supra-axillares gerentes, anno secundo plus minusve glabrescentes, leviter fusco-maculati, ramulos abbreviatos foliatis saepius ad pulvinos reductos interdum usque ad 2.5 cm. longos gerentes, anno tertio nitiduli,

lenticellati lenticellis oblongis pluribus saepe longitudinaliter confluentibus. *Folia primaria*: Petioli 0·6–2·5 cm. longi, densiuscule pubescentes; petioluli 3–4 mm. longi; foliola elliptico-ovata, apice acuta, basi inaequaliter rotundata vel latere superiore basi obtuso tantum, 4–8·5 cm. longa, 2·7–6 cm. lata, tenuiter coriacea, utrinque glabrescentia nervo medio utrinque pubescente excepto; nervi laterales utrinque 6–7, patuli, procul a margine anastomosantes, utrinque prominuli; stipulae subulatae, 1 mm. longae. *Folia ramulorum abbreviatorum*: Petioli 4–7 mm. longi, dense pubescentes; petioluli 2 mm. longi; foliola elliptica vel ovato-elliptica, apice rotundata vel obtusa, rarius acuta, latere inferiore basi rotundato superiore obtuso, 3–4 cm. longa, 2–3 cm. lata. *Spinæ* usque ad 7 cm. longae, saepius ramulo unico divergente. *Rami fertiles* inermes (vel spinulas nonnullas supra-axillares usque ad 4 mm. longas tantum gerentia), anno secundo 2–4 mm. diametro, fusco-maculati vel fusci, tenuiter pubescentes, ramulos floriferos hornotinos gerentes. *Ramuli floriferi* 2–15 cm. longi, basi 1–2·5 mm. diametro, folia usque ad 9 gerentes, ut pedunculi, pedicelli sepalaque extra dense viridulo-pubescentes; internodia 1·5–4 cm. longa. *Folia ramulorum floriferorum* (juniora tantum visa): Petioli 1–2·5 cm. longi, dense viridulo-pubescentes; petioluli 4–7 mm. longi; foliola late ovata vel elliptica, apice obtusa vel rotundata, rarius acuta, basi inaequaliter rotundata, basi lateris superioris 1–4 mm. supra basin lateris inferioris sita, 3·5–4·5 cm. longa, 3–3·5 cm. lata, chartacea, paullo discolora, supra tenuiter, subtus dense viridulo-pubescentia, nervis lateralibus utrinque prominulis inconspicuis. *Cymæ* axillares, solitariae, vel saepius binae, superpositae, superiores seniores; cymæ solitariae vel superiores 3–5-florae, inferiores 1–3-florae; pedunculi 1–5 mm. longi; pedicelli 3–5 mm. longi. *Sepala* ovato-oblonga vel elliptico-oblonga, acuta, vix 5 mm. longa, 2·3–2·5 mm. lata, extra dense viridulo-pubescentia, intra albo-sericea. *Petala* infra discum inter ejus cuspidis areolis ellipticis inserta, lanceolata, 6–7 mm. longa, 2–2·5 mm. lata, parte superiore glabra corrugata 1–1·5 mm. longa, parte superiore exclusa anguste obovata, supra albo-villosa. *Discus* pulvinaris, minute papillatus, supra excavatus margine truncato, in toto 1·5 mm. altus, parte excavata 0·6–0·7 mm. profunda; disci pars superior quam inferior pallidior, truncato-conica, 1 mm. alta, margine inferiore 10-crenato sinibus sepalis petalisque opposita; pars inferior stamina gerens, margine inferior 5-cuspidato cuspidibus oppositisepalis. *Stamina oppositisepala* in parte inferiore areolarum rhomboidearum supra cuspidis inserta; filamenta 2·8–3 mm. longa; antherae 1·6–1·7 mm. longae. *Stamina oppositipetala* infra sinus disci partis superioris inserta, labro minuto disci partis inferioris ab areolis petalorum disjuncta; filamenta 2·5 mm. longa; antherae 1·5–1·6 mm. longae. *Ovarium* subglobosum, 1·2–1·4 mm. altum, sordide viridulo-albido-tomentellum; stylus 0·8 mm. longus. *Drupa* oblongo-ellipsoidea, 3·5–4·5 cm. longa, 2·5–2·8 cm. diametro, basi cicatrice pedicelli valde impressa, apice cicatrice styli minus sed conspicue impressa, superne 5-sulcata sulcis e cicatrice styli deorsum divergentibus; epicarpium crustaceum, castaneum, 0·7 mm. crassum; mesocarpium fibroso-spongiosum, in sicco glutinosum, circiter 3 mm. crassum, butyro redolens; endocarpium lignosum, extra fibrosum, 3–4 mm. crassum. *Testa* duplex,

pallide fulva; embryo oblongo-ellipsoideus, circiter 2·5 cm. longus, valde sulcatus. — *Trachylobium mozambicense*, Sim, For. Fl. Port. E. Afr. p. 51, excl. char. nonnull., t. 56, non *T. mossambicense*, Klotzsch.

PORTUGUESE EAST AFRICA. Lebombo Mountains, and by the Umbeluzi River, *Maugham*. By the Rovuma River, *Kirk*. Madanda Forest, *Dawe*.

According to Mr. Dawe, *B. Maughamii* is known in the Madanda Forest by the native name "Manduro."

Balanites Dawei, *Sprague*; affinis *B. Maughamii*, *Sprague*, a qua fructibus elongatis petalorumque forma distinguitur.

Arbor 10–15 m. alta, trunco irregulari. *Rami* exstantes inermes, alteri steriles, alteri fertiles. *Rami steriles* rectiusculi, crassiusculi, anno primo leviter costati, ut petioli petiolulique dense viridulo-albo-pubescentes, inferne 6 mm. diametro; internodia 2·5–4 cm. longa. *Folia* (juniora tantum visa) gemmas tres seriales suffulcientia, quorum suprema 2 mm. longa, intermedia triplo minor, infima minima; petioli 2–3 cm. longi, canaliculati; petioluli 1–1·2 cm. longi; foliola late ovata, ex apice rotundato truncato vel retuso apiculata, basi inaequalite rotundata, basi lateris superioris circiter 3 mm. supra basin lateris inferioris sita, 6–7·5 cm. longa, 5–6 cm. lata, tenuiter herbacea, manifeste discolora, supra puberula, subtus dense viridulo-albo-pubescentia; nervi laterales utrinque 6–7, patuli, procul a margine anastomosantes, utrinque prominuli; rhachis supra insertionem petiolulorum in appendicem tomentellam 3 mm. longam producta; stipulae anguste triangulares, 2–3 mm. longae, tomentellae. *Rami fertiles* anno secundo circiter 3 mm. diametro 15–20 cm. infra apicem, leviter sulcati, fusco-maculati, tenuiter pubescentes, ramulos floriferos hornotinos gerentes. *Ramuli floriferi* 2–15 cm. longi, inferne 1·5–3 mm. diametro, folia usque ad 6 gerentes, ut petioli, petioluli, pedunculi pedicellique dense viridulo-albo-pubescentes; internodia 1·3–4·5 cm. longa. *Folia ramulorum floriferorum* iis ramorum sterilium similia at paullo minora, supra glabrescentia, superiora interdum acuta. *Cymae* axillares, solitariae, vel binae, superpositae, superiores seniores; cymae solitariae vel superiores simplices, 3–7-florae, vel racemosim ramosi usque ad 12-florae, bracteis triangulari-ovatis 2 mm. longis tomentellis; cymae inferiores 1–3-florae; pedunculi 0·1–1 cm. longi; pedicelli 0·7–1 cm. longi. *Sepala* deflexa, ovato-oblonga vel elliptico-oblonga, 5 mm. longa, 2–2·8 mm. lata, extra dense viridulo-albo-pubescentes, intra albosericicea. *Petala* oblanceolata, 8–9 mm. longa, 2–2·5 mm. lata, parte superiore glabra corrugata vix 2 mm. longa excepta supra densiuscule albo-villosa. *Discus* in toto circiter 1·8 mm. altus, parte excavata 0·6–0·8 mm. profunda; pars superior 1 mm. alta. *Filamenta* 3–3·2 mm. longa; antherae 1·5–1·7 mm. longae. *Ovarium* circiter 1·3 mm. altum, albido-tomentellum; stylus 0·8 mm. longus. *Drupa* clavato-cylindrica vel subcylindrica, 6·5–8 cm. longa, 2–3 cm. diametro, basi cicatrice pedicelli leviter impressa, apice cicatrice styli haud vel vix impressa, ab apice ad basin 5-sulcata sulcis superne magis conspicuis. *Embryo* clavatus, 4·5 cm. longus, basi acutus.

PORTUGUESE EAST AFRICA. Madanda Forest, *Dawe*.

EXPLANATION OF THE PLATES.

Balanites Maughamii.

- Fig. 1, part of barren shoot in the first year of its growth, showing the supra-axillary forked spines and a small bud beneath them.
 Fig. 2, part of barren shoot in the second year, bearing a cushion-like leafy short-shoot.
 Fig. 3, flowering shoot.
 Fig. 4, expanded flower.
 1-3, natural size ; 4, enlarged.

Balanites Dawei.

- Fig. 1, barren shoot in the first year of its growth, showing two of the three serial buds in each axil (the lowermost bud being concealed by the stipules).
 Fig. 2, flowering branch.
 Fig. 3, expanded flower.
 1-2, natural size ; 3, enlarged.

XXI.—NEW ORCHIDS: DECADE 40.

391. *Stelis barbata*, Rolfe ; a *S. Endresii*, Reichb. f., sepalis longe barbatis et labello tridenticulato differt.

Caules secundarii obsoleti vel brevissimi. *Folia* breviter petiolata, oblonga vel anguste elliptico-oblonga, tridenticulata, coriacea vel subcarnosa, 2-4 cm. longa, 5-7 mm. lata. *Scapi* gracillimi, 6-8 cm. longi, vaginis paucis tubulosis apice ovatis obtecti ; racemi secundi, 1.5-2 cm. longi, multiflori. *Bracteae* ovatae, acutae, basi tubulosae, 1.5-2 mm. longae. *Pedicelli* 2-2.5 mm. longi. *Flores* 3 mm. diametri. *Sepala* subreflexa, aequalia, ovata, subobtusata, facie longe barbata. *Petala* suborbiculari-ovata, obtusa, concava, 0.75 mm. longa. *Labellum* tridentatum, 0.75 mm. longum ; lobi laterales rotundati, subincurvi ; lobus intermedius suborbicularis. *Columna* brevissima, tridenticulata.

COSTA RICA. Near Cachi, Lankester.

Flowered at Kew in November, 1912. The flowers are ochreous green, with numerous rather long purple hairs on the sepals, a broad red-purple blotch on the upper part of the petals, and a smaller blotch on the front lobe of the lip.

392. *Eria* (§*Cylindrolobus*) *trilamellata*, Rolfe ; affinis *E. truncatae*, Lindl., sed planta minora, pedicellis glabris, et labelli lobo intermedio breviter trilobo differt.

Herba epiphytica, circiter 10 cm. alta. *Pseudobulbi* clavati, basi attenuati, 4-7 cm. longi, medio 5-9 cm. lati, apice 2-3-phylli. *Folia* lanceolata vel oblongo-lanceolata, subacuta, subcoriacea, 3.5-6 cm. longa, 0.8-1 cm. lata. *Scapi* terminales, circiter 2 cm. longi, apice biflori. *Bracteae* ovatae vel ovato-oblongae, acutae vel apiculatae, circiter 1.5 cm. longae, canaliculatae vel subconcaevae, patentes, pallide virides. *Pedicelli* circiter 1.3 cm. longi, glabri. *Flores* mediocres. *Sepalum* posticum elliptico-oblongum, subobtusum, concavum, 1.4 cm. longum ; sepala lateralia falcato-oblonga, obtusa, basi concava, 1.4 cm. longa ; mentum saccatum, 4 mm.

longum. *Petala* subfalcato-oblonga, obtusa, 1.3 cm. longa. *Label-lum* 8 mm. longum, apice breviter trilobum; lobi laterales late oblongi, incurvi, truncati, 2.5–3 mm. lati; lobus intermedius 1.5 mm. longus, 3 mm. latus, breviter tridentatus; discus trilamellatus, lamellis lateralibus a basi ad medium extensis glabris, lamella intermedia a medio ad apicem extensa dense vestita. *Columna* lata, 5 mm. longa.

SIAM. Bangkok, C. Roebelen.

Sent to Kew by M. Roebelen, from Bangkok, and flowered in the collection in February, 1913. The bracts are light emerald green, and the flowers white, with a light brown front lobe and a very hairy brown keel in front. The short lateral keels and base of the lip are also stained with the same colour, and there is a round yellow blotch on the base of the column and a brown papillose blotch on the front of the column foot.

393. *Acanthophippium sinense*, Rolfe; ab *A. striato*, Griff., foliis latoribus, scapis gracilioribus et paucifloris, et labello ampliore differt.

Herba terrestris. *Caules* subcylindrici, 5–7 cm. longi, vaginis spathaceis ovatis membranaceis amplis obtecti, apice diphylli. *Folia* petiolata, limbus late obovato-ellipticus, abrupte acuminatus, quinquenervis, membranaceus, 22–24 cm. longus, basi cuneatus; petiolus circiter 15 cm. longus. *Scapi* erecti, 12–15 cm. longi, basi vaginis spathaceis numerosis membranaceis imbricatis obtecti, 2–3 flori. *Bracteae* oblongo-lanceolatae, acuminatae, 2.5–3 cm. longae. *Pedicelli* 1.3–1.5 cm. longi. *Flores* mediocres. *Sepalum* posticum late elliptico-oblongum, obtusum, 2 cm. longum; sepala lateralia oblique ovata, subobtusum, 2 cm. longa; mentum conicum, 1.3 cm. longum. *Petala* ovato-oblonga, subobtusum, 2 cm. longa. *Labellum* unguiculatum; limbus latissime hastatus, apice triangulari-apiculatus, 1.4 cm. longus, 2.4 cm. latus, membranaceus; discus laevis; unguis 1 cm. longus. *Columna* clavata, 1.3 cm. longa.

CHINA. Swatow District: E. Kwangtung; collected on the Han Expedition, April, 1909, S. T. Dunn, in Hongkong Herb., 6504a.

394. *Phaius sinensis*, Rolfe; habitu *P. nano*, Hook. f., sed labello angustiore apiculato et calcarato differt.

Herba terrestris. *Pseudobulbi* breves, crassiusculi. *Folia* elliptico-lanceolata, acuta, plicata, circiter 15 cm. longa. *Scapi* erecti, circiter 25 cm. alti, vaginis spathaceis obtecti, pauciflori. *Bracteae* elliptico-lanceolatae, acuminatae, conduplicatae, 3 cm. longae. *Pedicelli* 1.6 cm. longi. *Flores* mediocres. *Sepalum* posticum lanceolatum, acutum vel acuminatum, 2.7 cm. longum; sepala lateralia oblongo-lanceolata, acuminata, 2.8 cm. longa, basi obliqua. *Petala* lanceolata, acuta, membranacea, 2.5 cm. longa. *Labellum* subtrilobum, 2.6 cm. longum, 1.8 cm. latum; lobi laterales oblongi, apice rotundati, subundulati; lobus intermedius orbiculari-quadratus, apiculatus, undulatus, 8 mm. latus; discus bicarinatus, pubescens; calcar oblonga, subacuta, leviter curvata, 5 mm. longa. *Columna* clavata, 1.7 cm. longa.

CHINA. Swatow District: E. Kwangtung; collected on the Han Expedition, April, 1909, S. T. Dunn, in Hongkong Herb., 6504.

395. *Cyenochoes Cooperi*, Rolfe; a *C. pentadactylo*, Lindl., sepalis petalisque aequibilter brunneo-suffusis et labelli lobis lateralibus latioribus differt.

Pseudobulbi fusiformi-oblongi, circiter 30 cm. longi, foliosi. *Folia* arcuata, elliptico-lanceolata, breviter acuminata, plicata, 20–35 cm. longa, 5–7 cm. lata. *Racemi* arcuati, 15–20 cm. longi, densi, multiflori, basi vaginis spathaceis obtecti. *Bractee* lanceolatae, acutae, concavae, circiter 2 cm. longae. *Pedicelli* 4 cm. longi. *Flores* masculi speciosi, fragrantés. *Sepalum* posticum oblongo-lanceolatum, subacutum, incurvum, concavum, 4 cm. longum; sepala lateralía subfalcato-oblonga, acuta, 3.5 cm. longa. *Petala* falcato-oblonga, acuta, 3.5 cm. longa. *Labellum* unguiculatum; limbus 5-lobus, basi concavus, 1.5 cm. longus, 1 cm. latus; lobus terminalis lanceolato-linearis, acuminatus, 1 cm. longus; lobi laterales rotundato-oblongi, obtusi, 5 mm. longi, apice oblique incurvi; lobi intermedií lineares, acuti, incurvi, 2 mm. longi; unguis 1.5 cm. longus, infra medium dente oblongo incurvo 4 mm. longo instructus. *Columna* arcuata, gracilis, apice clavata, 3.5 cm. longa.

S. PERU. *L. Forget.*

Flowered with Messrs. Sander & Sons, St. Albans, in January, 1913, when it received an Award of Merit from the Royal Horticultural Society. The plant is now in the collection of the Rev. J. C. B. Fletcher, Mundham Vicarage, Chichester, who has kindly forwarded materials for description and preservation. The sepals and petals are light mahogany brown, the side lobes of the lip whitish, and the column dull purple. The female flowers are not yet known.

396. *Oncidium bidentatum*, Rolfe; ab *O. fascifero*, Reichb. f., scapo subflexuosa brachyclado, labello basi lato, et columna inter alam bidentifera differt.

Pseudobulbi ovoideo-oblongi, subcompressi, 5–7 cm. longi, apice diphylli, basi diphylli. *Folia* arcuata, lineari-oblonga, subacuta, 15–18 cm. longa. *Scapi* graciles, subflexuosi, fere 2 m. alti; panicula elongata, brachyclada, ramuli subdistantes, pauciflori, subflexuosi. *Bractee* ovatae vel ovato-lanceolatae, acutae, membranaceae, 0.7–1.4 cm. longae. *Pedicelli* circiter 2 cm. longi. *Flores* mediocres. *Sepalum* posticum breviter unguiculatum, elliptico-oblongum, subacutum, undulatum, 1–1.2 cm. longum; sepala lateralía unguiculata, libera, lanceolata-oblonga, subacuta, undulata, 1.2–1.4 cm. longa. *Petala* elliptico-oblonga, subacuta, undulata, circiter 1 cm. longa. *Labellum* late panduratum, circiter 1 cm. longum, basi sublatius; lobi laterales quadrati vel late oblongi, truncati; lobus intermedius dilatatus, emarginatus vel breviter bilobus, minutissime crenulatus; crista carnosa, late obovata, margine tuberculato-crenulata, apice lobo parvo membranaceo dilatato et basi cornu oblongo suberecto 1.5 mm. longo instructa. *Columna* lata, 3 mm. longa, alis apice angustis vel subobsoletis basi subangulatis, inter alam utrinque dentem oblongum descendentem instructa.

ECUADOR. Huigra, in cactus region, 1225 m., *L. Lipscomb.*

Sent for determination by Mrs. Lipscomb, Wilton Grove, Wimbledon, who received it from her son, Mr. Lanceolot J. Lipscomb, when residing in Ecuador. The flowers are yellow, with a large amount of brown on the sepals and petals, and on the basal half of the lip.

397. *Dendrocolla Pricei*, Rolfe ; affinis *D. albae*, Ridl., sed foliis et scapis brevioribus, bracteis latis et obtusis et sepalis lateralibus multo latoribus differt.

Herba epiphytica. *Caulis* brevis. *Folia* subdisticha, lanceolato-oblonga, subobtusata, coriacea, patentia, 3-5 cm. longa, 7-9 mm. lata. *Scapi* axillares, gracillimi, 5-6 cm. longi, vaginis paucis brevibus spathaceis obtekti. *Bracteae* late ovato-squamaeformes, brevissime apiculatae, 1 mm. longae. *Pedicelli* 5 mm. longi. *Flores* mediocres. *Sepalum* posticum suberectum, oblongum, subobtusum, concavum, 8 mm. longum ; sepala lateralia oblique ovata, obtusa, subconcava, 6 mm. longa. *Petala* oblonga, obtusa, subconcava, 6 mm. longa. *Labellum* saccatum, 6 mm. longum, apice breviter trilobum ; lobi laterales auriculiformes, obtusi, subconcavi ; lobus intermedius subobsoletus, pubescens ; discus crista squamiformi instructus ; saccus 4 mm. longus, apice didymus. *Columna* ovato-oblonga, 2 mm. longa, latere subauriculata et incurva ; pollinia oblonga, sessilia ; glandula squamiformis.

FORMOSA. *W. R. Price.*

Sent to Kew in 1912 by Mr. W. R. Price, and flowered in the collection in February of the following year. The flowers are semipellucid white, with transverse brown bars on the sac of the lip, two orange blotches at the inner angles of the side lobes, and an orange apex to the crest.

398. *Cleisostoma acuminatum*, Rolfe ; a *C. breviracema*, Hayata, foliis longioribus et floribus fere duplo minoribus differt.

Herba epiphytica, nana, subacaules. *Folia* sessilia, anguste oblonga, acuminata, basi conduplicata, 9-15 cm. longa, 1.5-2.5 cm. lata. *Scapi* axillares, breves, circiter 1.5 cm. longi, subcorymbosi, pauciflori. *Bracteae* ovato-oblongae, obtusae, 2.5-3 mm. longae. *Pedicelli* 4-6 mm. longi. *Flores* parvi. *Sepala* incurva, subspathulato-oblonga, obtusa, 4 mm. longa, 2 mm. lata. *Petala* subincurva, oblonga, obtusa, 4 mm. longa, 1.5 mm. lata. *Labellum* 3-lobum ; lobus intermedius recurvus, late ovatus, subobtusus, 3.5 mm. longus ; lobi laterales erecti, subquadrati, truncati, 1 mm. lati, calcar ovoideo-globosum, dorsaliter subcompressum, 3 mm. latum, ore squama postica lata oblonga bifida subclausum. *Columna* lata, 2 mm. longa ; alae truncatae, carnosae, breves.

FORMOSA. *H. J. Elwes.*

Brought from Formosa by Mr. H. J. Elwes, and flowered in his collection at Colesborne, Cheltenham, in February, 1913. The sepals and petals are yellowish-green, with one or two large transverse purple blotches, and the lip cream white with a little yellow at the junction of the front and side lobes. The description is made from an inflorescence and a photograph of the plant.

399. *Mystacidium gracillimum*, Rolfe ; a *M. Batesii*, Rolfe, foliis latoribus, scapis et labelli calcare gracilioribus et floribus minoribus differt.

Folia lineari-oblonga, inaequaliter et brevissime bidentata, subcoriacea, 6-8 cm. longa, circiter 1 cm. lata. *Scapi* suberecti, gracillimi, 4-7 cm. longi, basi vaginis paucis tubulosis oblongis obtekti. *Bracteae* subpatentes, ovatae, subacutae, 2-3 mm. longae. *Pedicelli* gracillimi, 2.5-4 cm. longi. *Flores* parvi. *Sepalum*

posticum reflexum, ovatum, subacutum, convexum, circiter 1.5 mm. longum; sepala lateralia descendunt, subparallela, lineari-oblonga, subobtusata, circiter 6 mm. longa. *Petala* obliqua, reflexa, oblonga, subacuta, 1.5 mm. longa, basi calcaris ore decurrentia. *Labellum* breviter trilobum, patente, 4-5 mm. longum; lobus intermedius lineari-oblongus, obtusus, subcarnosus; lobi laterales oblique oblongi, obtusi, reflexi, 1 mm. longi; calcar pendulum, elongatum, gracillimum, 4 cm. longum, basi breviter infundibuliforme. *Columna* lata, brevissima; pollinarii stipites 2, filiformes, breves; glandulae distinctae, oblongae, parvae.

UGANDA. *E. Brown.*

Flowered in the Royal Botanic Gardens, Glasnevin, in December, 1911, and again a year later. The flowers are semipellucid white.

400. *Glossula calcarata*, *Rolfe*; a *G. tentaculata*, Lindl., labelli calcar clavato et triplo longiori facile distinguenda.

Herba terrestris, 25-40 cm. alta. *Folia* caulina, 3-4, sessilia, elliptico-lanceolata, acuta vel subobtusata, membranacea, 3.5-7 cm. longa, 1-2.3 cm. lata. *Scapi* 25-40 cm. alti; racemi 8-15 cm. longi, laxi, multiflori. *Bractee* ovatae-lanceolatae, acuminatae, 5-8 mm. longae. *Pedicelli* graciles, 5-7 mm. longi. *Flores* parvi. *Sepala* subconniventia, ovato-oblonga, obtusata, 3 cm. longa, uninervia; posticum subconcavum. *Petala* ovato-oblonga, obtusata, uninervia, 3 mm. longa. *Labellum* cum basi petalorum connatum, tripartitum; lobi laterales divergentes, filiformi-lineares, varie flexi, 0.8-1 cm. longi; lobus intermedius triangulari-oblongus, obtusus, 2 mm. longus; calcar clavatum, 4-5 mm. longum. *Columna* lata, 1 mm. longa.

S. CHINA. Lo-fau-shan Mountains, 180 m., *Ford*. Hongkong, *Voretzsch*. Hongkong Herb., 9620, 9621.

Originally collected on the Lo-fau-shan Mountains by Mr. C. Ford, and distributed as *Glossula tentaculata*, Lindl., and afterwards in Hongkong by Dr. E. A. Voretzsch. The spur is clavate, and three times as long as in *G. tentaculata*, to which it bears a general resemblance in other respects. It is difficult to make out the structure of the minute column and its appendages from dried specimens, but the stigmatic processes are not clavate, as in *Habenaria*, and I am inclined to think the genus must be kept distinct as was done by Lindley.

XXII.—THE GENUS MARAH.

S. T. DUNN.

When Sir William Hooker came to examine the botanical collections brought home from Sir John Franklyn's Expedition and the accumulation of material collected by Douglas, Scouler, Michaux and others in North America for his *Flora Boreali-Americana*, only two *Cucurbitaceae* were noted.*

Some of Michaux' Canadian specimens he identified as *Sicyos angulatus*, Linn., but with them he associated certain other plants collected by Scouler and Douglas on the banks of the Columbia

* Hook., Fl. Bor. Am., i, 20 (1834).

River (Oregon) bearing only male flowers, and which in fact represented, as it now appears, the first gatherings of the present genus. Six years later, with fuller materials in their hands, Torrey and Gray distinguished the Columbia River plants as a distinct species of the first-named genus (*Sicyos oregona*).*

It is not clear why it was not referred to the new genus, *Echinocystis*, appearing on the same page, with which its given characters seem better to agree, and to which it was subsequently reduced.

It was not until 1853 that the peculiar germination, the large tuberous roots and the marked fruiting characters of some plants obtained from N. California, convinced Kellogg that a distinct genus was represented. They were not associated by him with the Oregon species. But, like it and all the other species now recognised, its annual shoots spring from an extraordinarily large root—sometimes as large as a man's body—and climb by tendrils over bushes and small trees. In the early summer racemes of white or greenish male flowers and solitary female ones are produced from the axils of the palmately lobed leaves, and in the autumn the large prickly or bristly fruits are a conspicuous feature. Kellogg, in 1853, showed specimens and drawings of his species before the Californian Academy, special attention being drawn to the above remarkable characters. Two years later the Proceedings of that Academy—published at that period in a newspaper, "The Pacific"—contained a full description of this plant as a new genus under the name *Marah*,† so called from the bitter taste of the root.

At the meeting of the Academy, only a fortnight later, Kellogg exhibited specimens and drawings of a plant from Placerville having similar vegetative characters but different flowers and fruit, now recognised as *Marah* (*M. Watsoni*), but by him referred to *Echinocystis* (*E. muricata*).‡ As he was at first in doubt as to which of the two genera should receive it, it is surprising that the possible inconvenience of bestowing upon it the same trivial name as that of his original *Marah muricatus* did not occur to him.

In 1859 he added a second species to his genus, *Marah minima*§ from Cedros Island, but this is now referred to *Echinopepon*. In the same year appeared Naudin's classical account of the *Cucurbitaceae* cultivated in the Jardin des Plantes in Paris,|| which contained a description and fine engraving of a plant raised from a tuber received from California, and which he referred to *Echinocystis* under the name of *E. fabacea*.

In 1876 Sereno Watson described another Big Root from the Island of Guadalupe, off the Mexican coast, referring it and the four previously described to *Megarrhiza*.¶

This excellent name proposed by Torrey a year before Kellogg published his genus *Marah* remained unfortunately unaccompanied by a description as a mere *nomen nudum* for some years after the other had been established, and cannot now be restored. It is

* Torrey and Gray, Fl. N. Am., i (1840), 542.

† Proc. Calif. Acad., i. (1855), 38.

‡ Lc. 42, 56.

§ Proc. Calif. Acad., ii (1859), 18.

|| Ann. Sci. Nat. 6^e sér. xii, 154.

¶ *M. guadalupensis*, Watson in Proc. Am. Acad., xi, 133.

exactly synonymous with *Marah* as here circumscribed. In 1881 Cogniaux published in De Candolle's *Monographiae Phanerogamarum* his splendid monograph of this difficult Natural Order. *Marah* was constituted a section of *Echinocystis* to be distinguished by its enormous rootstocks, its subterraneous germination, and from all but § *Eu-echinocystis*—i.e., from all but *E. lobata*—by the irregular apical bursting of its fruit. In the same year Greene described a curious species from the sandy banks of the upper Gila River in New Mexico.*

In 1885 the same botanist recognised the distinct status of the Big Roots inhabiting the south-west coast of California, and named them *Echinocystis macrocarpa*, believing them to be congeneric with the Eastern Balsam Apple (*E. lobata*), for which the generic name has 14 years' priority over *Megarrhiza*. But, in 1890, discovering a still earlier generic name for the last-mentioned species, i.e., *Micrampelis* of Rafinesque (1808), he transferred all the seven Big Roots to it.

As the interior of California began to be more thoroughly submitted to botanical exploration several more species were discovered, including *E. horrida*† and *E. inermis*,‡ by Congdon in Mariposa County, and *E. scabrida*§, which appears to be nearly allied to the last, by Miss Alice Eastwood in Fresno County. In his enumeration of the Californian species Congdon (*Erythraea*, l.c.) employs the useful classification, which he attributes to Greene, depending upon the rotate or campanulate shape of the corollas. The two species added in the present paper bring the total number up to eleven.

There has been no doubt among botanists as to the affinity *inter se* of these plants since the same remarkable vegetative characters were seen to be shared by so many west coast species, but Kellogg was the only writer who clearly showed their generic distinction from the Balsam Apple (*E. lobata*) of the older states, which they resemble in flowers and fruit. Through all the numerous changes of name demanded by the views of different botanists upon the question of priority, the conception of the Big Roots as a natural group has remained intact. Cogniaux recognised them as a section, and Dr. J. N. Rose has proposed their re-establishment as a genus.||

It is with the help of 82 sheets of excellent specimens courteously lent to the Royal Botanic Gardens by the Smithsonian Institution that I have undertaken the revision of the genus. The material in the Kew Herbarium is remarkably full and contains some particularly valuable old types, including some of Naudin's specimens of *E. fabacea* from the Paris garden and the Columbia River material (*E. oregona*) seen by Hooker.

The characters by which *Marah* is distinct from allied genera having already been referred to, a more particular account of the origin and present position of these genera will now be given. The first

* *Megarrhiza gilensis*, Greene in Bull. Torr. Club, viii, 97.

† *Erythraea*, vii (1900), 184.

‡ Zoe, v (1901), 134.

§ Bull. Torr. Club, 1903, 500.

|| Contrib. U.S. Nat. Herb., v (1897), 115.

known of all the allied species was the Balsam Apple for which Torrey and Gray founded the genus *Echinocystis* (1840). This is not the oldest name but the Vienna Congress of botanists directed that it should be retained. The older name of Rafinesque was considered obsolete from long disuse. *Marah* was recognised as distinct by Kellogg in 1855 as above described. This and *Echinopepon* were treated as sections of the first by Cogniaux in his monograph, the latter being distinguished by its normal (epigeous) germination, its small compressed corrugated seeds, 4-6 together in cells which open regularly by pores or by an operculum at the top. It was not until later that he admitted this group to generic rank. In 1890 (Proc. Calif. Acad. ser. 2, iii, 58) he described a reduced type with a one-celled ovary, and in the following year another with a two-celled ovary (*Brandegea* and *Vaseyanthus*) both having indehiscent fruits.

The distribution of these genera as far as is known at present is as follows :—*Echinopepon* is chiefly tropical but extends as far as the southern border of the United States in New Mexico. From a short distance north of this area *Marah* inhabits the country draining into the Pacific* as far as British Columbia. Between the two and overlapping both regions is *Brandegea* and, further south, *Vaseyanthus*. *Echinocystis* is a plant of the Eastern and Central States.

With the exception of the latter these genera are new to or at least not upheld in Bentham and Hooker's *Genera Plantarum*. They might perhaps be interpolated in Herbaria, in which the sequence of that work is adopted, as follows, with the numbers indicated.

KEY TO GENERA ALLIED TO ECHINOCYSTIS.

Fruit dehiscent.

Dehiscence of fruit irregular.

Germination epigeous; seeds compressed 51. *Echinocystis*.

Germination hypogeous; seeds turgid 51-1. *Marah*.

Dehiscence of fruit regular 51-2. *Echinopepon*.

Fruit small, indehiscent.

Ovary 1-locular 51-3. *Brandegea*.

Ovary 2-locular 51-4. *Vaseyanthus*.

MARAH.

Marah, Kellogg in Proc. Calif. Acad., i. (1855), 38. *Flores* monoici. *Masculi* racemosi vel paniculati. *Calycis* tubus campanulatus vel pateriformis, lobis 5, filiformibus vel obsoletis. *Corolla* profunde 5-partita, rotata, vel 5-lobata, campanulata, lobis oblongis vel lanceolatis. *Stamina* 3, filamentis in columnam connatis; antherae connatae, loculis flexuosis. *Foeminei* solitarii vel in eadem axilla cum masculis enati. *Calyx et corolla* maris. *Staminodia* nulla vel 3, liberá vel stylo adnata. *Ovarium* ovoideum, rostratum, saepissime setiferum, 2-4-loculare; stylus brevis, stigmatem hemisphaerico 2-5-lobato; ovula in loculis 1-8, erecta,

* *M. oregonus* extends into the Atlantic catchment area.

parietalia. *Fructus* siccus vel baccatus, longe dense echinatus vel setis fortibus vel laxis longis dense vel tenuiter vestitus, glaber vel breviter tomentosa, 1-4-locularis, intus fibrosus, ad 30-spermus. *Semina* varia, magna, laevia, turgida, margine saepe lineis fuscis notata.

Herbae scandentes. Germinatio hypogaea. Radix maxima, tuberosa, perennis. Folia palmatim 5-7-lobata. Cirrhi 2-3-fidi, rarius simplices.

The 11 species are found only on the Pacific watershed of N. America from Vancouver to Lower California, with the exception of *M. oregonus* which extends as far as Nebraska.



MAP OF WESTERN STATES OF N. AMERICA.

The numbered areas enclosed by broken lines indicate the habitats of the different species of *Marah* as enumerated below. The distribution areas of the allied western genera, *Brandegea*, *Echinopepon*, and *Vaseyanthus* are shown by dotted lines.

- | | |
|-----------------------------|---------------------------|
| 1. <i>M. micranthus</i> . | 7. <i>M. major</i> . |
| 2. — <i>guadalupensis</i> . | 8. — <i>macrocarpus</i> . |
| 3. — <i>horridus</i> . | 9. — <i>fabaceus</i> . |
| 4. — <i>Watsoni</i> . | 10. — <i>gilensis</i> . |
| 5. — <i>muricatus</i> . | 11. — <i>inermis</i> . |
| 6. — <i>oregonus</i> . | |

CLAVIS SPECIERUM.

- | | |
|---|---------------------------|
| 1. Florum masculorum tubus campanulatus ;
petala erecta | 2 |
| florum masculorum tubis rotatus ; petala
patentia | 7 |
| 2. flores masculi 1-3 mm. longi | 1. <i>micranthus</i> . |
| flores masculi 6 mm. longi vel longiores... | 3 |
| 3. ovarium setosum ad basin rostri abrupti
ovarium glabrum vel in apicem glabrum
infra rostrum angustatum ; fructus
glaber vel laxe setosus | 4
5 |
| 4. rostrum longum, pubescens ; fructus
parvus, globosus, setis mollibus ... | 2. <i>guadalupensis</i> . |
| rostrum breve, glabrum ; fructus magnus,
oblongus, fortiter spinosus | 3. <i>horridus</i> . |
| 5. ovarium glabrum vel paucisetosum ;
semina globularia, haud zonata ... | 4. <i>Watsoni</i> . |
| ovarium fere ad apicem dense setosum... | 6 |
| 6. foliorum lobi oblongi, ad basin angustati ;
staminodia libera | 5. <i>muricatus</i> . |
| foliorum lobi triangulares, basi lati ;
staminodia angusta, stylo adnata ... | 6. <i>oregonus</i> . |
| 7. flores 1 cm. diametro vel latiores ... | 8 |
| flores ad 7 mm. diametro | 9 |
| 8. folia ad 30 cm. diametro ; flores ad
1.4 cm. diametro ; semina 4-8, ad
3.5 cm. diametro | 7. <i>major</i> . |
| folia ad 14 cm. diametro ; flores ad 1 cm.
diametro ; semina 16, ad 2.5 cm. diam-
etro | 8. <i>macrocarpus</i> . |
| 9. fructus fortiter dense spinosus | 9. <i>fabaceus</i> . |
| fructus glaber vel setis mollibus | 10 |
| 10. pedicelli 3 mm. longi | 10. <i>gilensis</i> . |
| pedicelli 6 mm. longi | 11. <i>inermis</i> . |

1. *M. micranthus*, *Dunn*, sp. nov. *Caulis* tenuis, striatus, scabridus. *Folia* ambitu orbicularia, dimidio altius palmatim 5-7-lobata, 6-10 cm. diametro, supra et in margine brevissimis setis tuberculatis scabra, lobis oblongis sinuato-dentatis, sinubus rotundatis ; petiolus bis folio brevior ; cirrhi tenues, glabri, bifidi. *Flores masculi* racemosi ; pedunculus communis gracilis, ut pedicelli et perianthii puberulus, vix maturus 2 cm. longus ; pedicelli filiformes, 4 mm. longi. *Calycis tubus* campanulatus, 1 mm. longus, lobis obsoletis. *Petala* lanceolata, acuta, 1-1.5 mm. longa. *Columna staminea* brevis ; capitulum antherarum 1 mm. longum, tubum calycinum paullo excedens. *Flores foeminei* non visi. *Fructus* ovatus, glaber, 4 cm. latus, 5 cm. longus, aculeis complanatis, 5-8 mm. longis dense armatus, 6-8-spermus. *Semina* ovata, 1.3 cm. longa, 8 mm. diametro, lineo nigro albo-marginato longitudinaliter cincta.

LOWER CALIFORNIA. Cedros Island, *Rose* 16,159. Flowers expanded while the fruit of the previous year is ripe, in March.

2. *M. guadalupensis*, Dunn. *Megarrhiza guadalupensis*, Watson in Proc. Am. Acad. xi. 115, 138. *Echinocystis guadalupensis*, Cogn. in DC. Monogr. Phan. iii. 819. *Micrampelis guadalupensis*, Greene, Pittonia, ii. 129 pp.*

The ovary has the same shape and the same covering of bristles as those of *M. fabaceus* and *M. macrocarpus* but the tomentum which persists in fruit distinguishes it from the other species of the genus.

GUADALUPE ISLAND (Mexico). Anthony 234, Franceschi 47, Palmer 33.

3. *M. horridus*, Dunn. *Echinocystis horrida*, Congd. in Erythraea, vii. (1900) 184.

CENTRAL CALIFORNIA. Mariposa County, the commonest species of the genus in the foot hills, Congdon; Tulare County, Kaweah River Valley (Sierra Nevada Mts.), F. R. S. Balfour.

4. *M. Watsoni*, Dunn. *Echinocystis muricata*, Kellogg in Proc. Calif. Acad. i. 57 (1855) non Cogn. et non *Marah muricatus*, Kellogg; *E. Watsoni*, Cogn. l.c. 819. *Megarrhiza muricata*, Wats. l.c. *Micrampelis Watsoni*, Greene, Pittonia, ii. 129.

CALIFORNIA. Placer and Amador Counties, Hansen 37. Brandegee (Zoe, i. 137) notes that the fruit is usually 4-8-seeded.

5. *M. muricatus*, Kellogg in Proc. Calif. Acad. i. 38 (1855) *Megarrhiza Marah*, Wats. l.c. 138. *Echinocystis Marah*, Cogn. l.c. 817; Congd. in Zoe, v. 134. *Micrampelis Marah*, Greene l.c. 129.

CALIFORNIA. Santa Clara, San Mateo, Mendocino, Marin and Sonoma Counties. Baker 450, 3200, Brown 778, Chesnut 245, Greene, Heller & Brown 5023, Congdon, Jepson, Kellogg & Harford 295, McMurphy 71, Michener & Bioletti, Vasey, Wight 13.

The leaves are large and the lobes most usually overlapping and divided by round sinuses. The male flowers are moderate in size.

6. *M. oregonus*, Howell in Fl. N.W. Am. i. (1897) 239. *Sicyos oregonus*, Torr. & Gr., Fl. N. Am. i. 542 (1840); *S. angulatus*, Hook. Fl. Bor. Am. i. 20 (1834) pp. non Linn. *Megarrhiza oregona*, Torr. Pacif. Rly. Rep. vi. 74 (1857) nomen; Wats. in Proc. Am. Acad. xi. (1876), 138. *Echinocystis oregona*, Cogn. l.c. *Micrampelis oregona*, Greene, l.c. 129.

N.W. UNITED STATES. Washington, Oregon, Idaho, Montana and Nebraska. Applegate 2194, Ball, Cusick 2523, Hammond 151, Heller 3873, Heller & Brown 5517, Hinds, Howell, Lamb 1184, Lyall, Suksdorf.

7. *M. major*, Dunn, sp. nov. *Caulis* robustus, ad 7 m. scandens, striatus, scabrellus. *Folia* ambitu orbicularia ad dimidium 5-7-lobata, ad 30 cm. diametro, glabra, sparse tuberculata, lobis ovatis sinuatis vel sinuato-dentatis, sinubus rotundatis vel obtusis; petiolus circiter bis folio brevior; cirrhi glabri, robusti, trifidi. *Flores masculi* albi, 2-3 cm. lati, in racemis 20-30 cm. longis dispositi; pedunculus communis ut pedicelli gracilis, glaber; pedicelli 2 cm.

* The specimens from the islands off the coast of California may be a different species.

longi. *Calycis tubus* patulus, ut lobi utrinque sparse molliter tuberculatus; lobi lanceolati, acuti, tubo bis vel ter longiores. *Columna staminea* brevis, glabra; capitulum antherarum 2 mm. longum, tubum paullo excedens. *Flores foeminei* 2.5 cm. longi. *Calyx corollaeque* mari similes. *Ovarium* ovoideum, in rostrum equilongum glabrum angustatum, dense setosum; stigma globosum, sessile; loculi 4, 2-ovulati. *Fructus* ovoideus, 7 cm. longus, 4 cm. latus, aculeis complanatis 5-8 mm. longis sparsis armatus. *Semina* 4-8* ovata, compressa, magnitudine varia, ad $3.5 \times 3 \times 1$ cm., lineo fusco lato in circumferentia majore notata.

S. CALIFORNIA ISLANDS. San Catalina, San Clementi, San Nicolas. *Trask* 91, 280, 281.

The plant is common in moist cañons in some of the islands. *Trask* records that its white flowers are produced in May and June and that its roots, which are often left partly exposed, are as large as small barrels.

8. *M. macrocarpus*, *Dunn*. *Echinocystis macrocarpa*, *Greene* in *Bull. Calif. Acad.* i. 188 (1885); *Hall* in *Univ. Calif. Publ. Bot.* i. 122. *Micrampelis macrocarpa*, *Greene* in *Pittonia*, ii. 129.

SOUTHERN AND LOWER CALIFORNIA. Santa Barbara, San Diego, San Bernardino, Riverside, Los Angeles Counties and St. Quentin's Bay. *Abrams* 3130, *Bingham*, *Braunton* 748, 797, *Brewer* 150, *Colville & Funston*, *Brandeggee* 3429, *Dunn*, *Eastwood* 93, *Hasse*, *Henshaw* 84? 219?, *Jones*, *Lieberg* 3116, *Orcutt*, *Palmer* 668, *Parish* 4140, 3633, *Shorting*, *Thurber* 578, *Vasey* 214, *Vesey* 35.

Frequent in the hills and Chaparral (scrub) belt where it flowers from February to May. It is characterised by its blunt overlapping leaf-segments and the deep rounded sinuses between them. From *M. fabaceus* to which it was at first referred it differs in its larger male flowers and in its seeds 14 or even as many as 29 in number; not 4 as is usual in *M. fabaceus*, and 2 cm. long not 4 cm. as in that species.

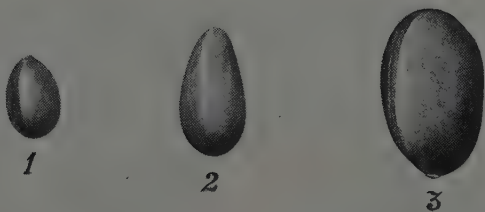
9. *M. fabaceus*, *Dunn*. *Echinocystis fabacea*, *Naud.* in *Ann. Sci. Nat. sér.* 4, xii. 154 (1859); *Cogn.* l.c. 816; *Congd.* l.c. 133. *Megarrhiza californica*, *Torr.* in *Pacif. Rly. Rep.* vi. 74 (1857) nomen; *Wats.* in *Proc. Am. Acad.* xi. 138 (1876).

N. CENTRAL CALIFORNIA. Coastal regions. Santa Clara, San Francisco, Monterey, Santa Barbara, Sonoma and Placer Counties. *Ames*, *Brewer* 1299, 2757, *Bridges* 118, *Cooper* 300, *Davy* 6806, *Baker* 512, *Ball*, *Heller* 7262, *Barclay* 119, *Hansen* 106, *Jones*, *Kellogg & Harford* 294, *Naudin*, *Plaskett* 96, *Samuels* 80, *Vasey* 213.

This species was described by *Naudin* from cultivated plants in the Jardin des Plantes in Paris. His type specimens in the Kew Herbarium agree exactly with those since contributed from natural habitats in central California.

10. *M. gilensis*, *Dunn*. *Megarrhiza gilensis*, *Greene* in *Bull. Torr. Club*, viii. (1881) 97. *Echinocystis gilensis*, *Greene* in *Bull. Calif.*

* *vide* *Brandeggee* in *Zoe*, 137.



SEEDS AND FRUITS OF MARAH.

Acad. i. 189., Pitt. i. 3. *Micrampelis gilensis*, Britt. in Trans. N.Y. Acad. viii. (1889) 67.

S.E. UNITED STATES. Arizona and New Mexico. *Greene*, *Griffiths* 3920, *Jones*, *Palmer* 153, *Pringle*, *Rusby* 141, *Toumey*.

This species has the slender growth, small flowers and leaves of the eastern *Echinocystis lobata* but the perennial root and turgid seeds of the Pacific genus.

11. *M. inermis*, *Dunn*. *Echinocystis inermis*, Congd. in *Zoe*, v. 134 (1901).

CALIFORNIA. Mariposa County. *Hansen* 1061 ?

Echinocystis scabrida, Eastw. in Bull. Torr. Club, 1903, 500 (from Fresno County) is unknown to me, but from the description it seems very near the above species.

EXPLANATION OF PLATE.

Fig. 1.—Seed of *M. macrocarpus* (*Thurber*, 578).

Fig. 2.—Seed of *M. horridus* (2.5 cm. long).

Fig. 3.—Seed of *M. major*, 3.2 cm. long (*Trask*, 91).

Figs. 4, 5.—*M. horridus* (*F. R. S. Balfour*), old capsule and newly dehiscent capsule.

XXIII.—NEW SPECIES OF SEDUM PRESERVED IN THE HERBARIA OF KEW AND THE BRITISH MUSEUM.

RAYMOND HAMET.

Sedum Mossii, **R. Hamet*, sp. nova.—*Planta* . . . *Radices* . . . *Caules* floriferi erecti; graciliusculi, simplices (?), glabri. *Folia* alterna, sessilia, infra insertionem in calcar producta, glabra; calcar integrum, obtusum; lamina obovato-lanceolata vel sublanceolata, marginibus integerrimis, apice acuta et cuspidata, longior quam latior. *Inflorescentia* corymbiformis, satis laxa. *Pedicelli* calyce longiores vel paulo breviores. *Flores* satis numerosi. *Bractee* superiores sessiles, infra insertionem in calcar productae, glabrae; calcar integrum, obtusum; lamina ovata, marginibus integerrimis, apice acuta, longior quam latior. *Calyx* glaber, segmentis 5 tubo longioribus infra insertionem in calcar non productis ovatis marginibus integerrimis, apice acutis et extra e papillis nonnullis instructis, longioribus quam latioribus. *Corolla* glabra, calyce longior, segmentis 5 tubo multo longioribus subovato-lanceolatis, marginibus integerrimis, apice acutis vix mucronatis, mucrone petali apicem leviter superante, longioribus quam latioribus. *Stamina* 10, glabra; filamenta late linearia, oppositipetala, infra corollae medium inserta; antherae late subreniformes, apice et basi emarginatae,

* Cette espèce est dédiée à M. le Dr. C. E. Moss, Conservateur de l'herbier de l'Université de Cambridge qui in a obligeamment communiqué les *Crassulacées* conservées dans cet établissement. Je le prie ici d'accepter cette dédicace en témoignage de ma grande reconnaissance.

paulo longiores quam latiores vel tam longae quam latae, superiores corollae medium superantes. *Carpella* 5, multiovulata, glabra, in stylos carpellis breviores attenuata. *Squamae* 5, sublineares, marginibus integerrimis, apice obtusae vel emarginatae, longiores quam latiores. *Folliculi* 5, multiseminati, erecti, lateribus internis non gibbosis. *Semina* obovato-oblonga, testa laevi nucleum duabus extremitatibus non superante.

Caules floriferi 10–11 cm. longi (?).—Foliorum calcar 1.4–1.5 mm. longum; lamina 0.8–1.6 cm. longa, 2.6–4.6 mm. lata.—Inflorescentia 3.5–4.5 cm. longa, 3–4.5 cm. lata.—Bractearum calcar 1.4–1.55 mm. longum; lamina 2.4–4.4 mm. longa, 1.2–2 mm. lata.—Pedicelli 2.75–4 mm. longi.—Calycis pars concreta 0.5–0.6 mm. longa; pars libera 2.4–3.25 mm. longa, 1.4–1.6 mm. lata.—Corollae pars concreta 0.2 mm. longa; pars libera 5.6–7 mm. longa, 2–2.5 mm. lata.—Staminum alternipetalorum filamentorum pars concreta 0.2 mm. longa; pars libera 4–4.4 mm. longa, 0.4–0.45 mm. lata.—Staminum oppositipetalorum filamentorum pars concreta 0.4 mm. longa; pars libera 3–3.4 mm. longa, 0.35–0.4 mm. lata.—Antherae 0.9–1 mm. longae, 0.6–1 mm. latae.—Carpellorum pars concreta 0.9–1.2 mm. longa; pars libera 2.8–3 mm. longa.—Styli 1.2–1.4 mm. longi.—*Squamae* 0.5–0.55 mm. longae, 0.15–0.2 mm. latae.—*Semina* 0.5–0.55 mm. longa, 0.25 mm. lata.

CHINA. Between Batang and Tachienlu, Sept.–Oct., 1904, *Hosie*.—Herb. Kew.

Obs.—*S. Mossii* a *S. Balfouri*, R. Hamet,* cui affinis: 1° foliis marginibus non ciliatis; 2° sepalis ovatis, et non longe deltoideis; 3° squamis latioribus.

Sedum *Hobsonii*, *Prain* mss.—*Planta* perennis, steriles caules non edens. *Radices* crassiusculae. *Caudex* erectus, crassus, simplex, glaber, caulibus vetulis et desiccatis cinctus, apice gemmulam evolutam, caules floriferos basi squamis cinctos, et caules floriferos desiccatos, ferens. *Gemmulae* evolutae externae deltoidei-subsemi-orbiculares, a basi usque ad apicem attenuatae, apice in caudam brevem vel longiusculam, squamam breviorē, linearem, subteretem, obtusiusculam, productae, longiores quam latiores. *Gemmulae* evolutae squamae internae petiolatae; petiolo lamina paulo longiore vel paulo breviorē, in parte superiore plus minusve longa, late lineari, in parte inferiore dilatatissimo et deltoidei-subsemi-orbiculari; lamina ovato-oblonga, marginibus integris, apice obtusiuscula, longiore quam latiore. *Gemmulae* evolutae squamae interiores longe petiolatae; petiolo lamina longiore, longiore quam latiore, lineari, in parte inferiore valde dilatato et deltoidei-subsemi-orbiculari; lamina ovato-oblonga, marginibus integris, apice obtusiuscula, longiore quam latiore. *Caules* floriferi erecti, graciliusculi, simplices, glabri. *Folia* alterna, infra insertionem in calcar non producta, plana, glabra, ovata, marginibus integerrimis, longiora quam latiora, basi in pseudo-petiolum a lamina vix distinctum, latum, et lamina multo breviorē, contracta, apice obtusiuscula. *Inflorescentia* pauciflora, corymbiformis. *Bractae* foliis similes. *Pedicelli*

* Hamet, in *Plantae Chinenses Forrestianae*, pp. 116 et 117, et tab. LXXXVI (1912).

glabri, calyce breviores. *Calyx* glaber, segmentis 5; tubo longioribus, basi in calcar non productis, deltoideis vel ovato-deltoideis, marginibus integerrimis, apice acutis, longioribus quam latoribus. *Corolla* glabra, calyce longior, segmentis 5, tubo multo longioribus subobovatis, basi leviter coartatis, in parte superiore usque ad apicem acutum et mucronatum attenuatis, mucrone petali extremitatem vix superante, marginibus integerrimis, longioribus quam latoribus. *Stamina* 10, glabra; filamenta oppositipetala lineari-deltoidea, infra corollae medium inserta; antherae corollae medium superantes et petalorum apicem subattingentes, longe reniformi-ovatae, apice cuspidatae, longiores quam latiores. *Carpella* 5, pauciovulata, glabra, in stylos carpellis breviores attenuata. *Squamae* 5, sublineari-teretes, apice obtusae vel emarginatae, longiores quam latiores. *Folliculi* pauciseminati, erecti, lateribus internis non gibbosis. *Semina* obovata, apice obtusissima, longiora quam latiora, testa e rugis in longitudinem dispositis prominulis instructa, et nucleum apice paulo superante.

Caudex 5 cm. longus, 1.5 mm. e diametro.—Gemmulae evolutae squamarum externarum lamina 2-2.4 mm. longa, 1.6 mm. lata; cauda 1-1.6 mm. longa, 0.4 mm. lata.—Gemmulae evolutae squamarum internarum petiolus 3.2-4 mm. longus, 2-3 mm. latus; lamina 2.4-4.4 mm. longa, 0.8-1.2 mm. lata.—Gemmulae evolutae squamarum interiorum petiolus .86-1.5 cm. longus, 2.5-3.2 mm. basi latus, 0.6-1.2 mm. medio latus; lamina

Caules floriferi 5.5-13.5 cm. longi.—Caulium floriferorum folia 6-7.6 mm. longa, 2-3.5 mm. lata.—Inflorescentia 0.7-3.5 cm. longa, 1.2-4.5 cm. lata.—Pedicelli 0.75 mm. longi.—Calycis pars concreta 0.8-1.3 mm. longa; pars libera 3.6-5.2 mm. longa, 1.5-2.2 mm. lata.—Corollae pars concreta 0.2 mm. longa; pars libera 6.6-8 mm. longa, 2-3 mm. lata.—Staminum alternipetalorum filamentorum pars concreta 0.2 mm. longa; pars libera 5.2-6.3 mm. longa, 0.4-0.7 mm. lata.—Staminum oppositipetalorum filamentorum pars concreta 2-2.8 mm. longa; pars libera 3.3-4 mm. longa, 0.4-0.6 mm. lata.—Antherae 0.9 mm. longae, 0.65 mm. latae.—Carpellorum pars concreta 1.4-1.9 mm. longa; pars libera 3.3-3.6 mm. longa.—Styli 1.45-2 mm. longi.—Squamae 0.8-1 mm. longae, 0.45-0.6 mm. latae. Semina 0.8 mm. longa, 0.3 mm. lata.

TIBET. Yatung, *H. E. Hobson*.—Specimen authenticum; Gup-ten-de-la, a little above Chumbi, *King*.—Gum-bo-teen, 2000 ft. above Chumbi, *Dunghoo*.

Obs.—Haec species, quamvis *S. dumuloso*, Franchet,* *S. Liciae*, R. Hamet,† *S. linearifolio*, Royle,‡ valde affinis sit, distinctissima est. A *S. dumuloso*: 1° petalis apice mucronatis, mucrone petali extremitatem vix superante, marginibus integerrimis, et non apice aristatis, arista petali extremitatem longe superante, marginibus erosis; 2° foliis ovatis, et non lineari-oblongis vel lineari-ovatis, differt.

De *S. Liciae*: 1° foliis ovatis, marginibus integerrimis, basi in pseudo-petiolum a lamina vix distinctum, latum, et lamina multo

* Franchet, *Plantae David*, t. I, p. 129 (1884).

† Hamet, *Sedum Praini*, *S. Levi*, *S. Liciae*, in *Bull. Soc. Bot. France*, t. lvi—, pp. 568-570 (1909).

‡ Royle, *Illustr. Bot. Himal.*, p. 222, tab. xlviii, fig. 1.

breviorem contractis, apice obtusiusculis, et non petiolatis, petiolo gracili, lamina orbiculari, crenata, apice obtusissima; 2° caudice erecto, caulibus floriferis vetulis et desiccatis cincto, et non repente, nudo; 3° petalis apice mucronatis, mucrone petali extremitatem vix superante, et non apice aristatis, arista petali apicem longe superante, discrepat.

A *S. linearifolio*: 1° caudice erecto, caulibus floriferis setulis et desiccatis cincto, et non repente, nudo; 2° sepalis acutis, et non obtusis; 3° petalis acutis, et non subobtusis, distat.

Denique ab his 3 speciebus gemmulae evolutae squamis foliiformibus, dissidet.

Sedum Stapfii, *R. Hamet* sp. nova.—*Planta* perennis, steriles caules non edens. *Tuberculum* (?) apice gemmulam et caulem floriferum ferens. *Gemmulae* squamae longe deltoideae, in parte inferiore dilatatae, apice acutae, longiores quam latiores. *Caules* floriferi erecti, circiter in medio foliorum verticillum ferentes, infra verticillum crassiusculi, nudi et simplices, supra verticillum graciles, nudi, simplices vel ramosi, quoque ramo a flore solitario terminato. *Folia* per 5 vel 6 verticillata, infra insertionem in calcar non producta, petiolata, glabra; petiolo lamina brevior, late lineari, basi non dilatato, longiore quam latiore; lamina ovata vel ovato-oblonga, marginibus integerrimis, apice obtusiuscula, longiore quam latiore. *Flores* ♀: *Calyx* glaber, segmentis 5 tubo longioribus basi in calcar non productis lineari-deltoideis vel deltoideis basi dilatatis vel non dilatatis, apice obtusiusculis vel obtusis, marginibus integerrimis, longioribus quam latioribus. *Corolla* glabra, calyce paulo longior vel paulo brevior, tubo inconspicuo, segmentis 5, obovatis vel suborbicularibus, in parte inferiore coartatis et basi dilatatis, in parte superiore usque ad apicem subobtusiusculum attenuatis, marginibus erosis, longioribus quam latioribus. *Carpella* 5, glabra, in stylos crassiusculos, carpellis longiores, attenuata. *Squamae* 5, sublineares vel subquadratae, basi non dilatatae vel dilatatae, apice obtusissimae, paulo longiores quam latiores. *Folliculi* 5, erectiusculi, lateribus internis non gibbosis. *Semina* obovata, basi subacuta, apice obtusissima, paulo longiora quam latiora, testa laevi nucleum duabus extremitatibus non superante.

Gemmulae squamae 0.7–1 cm. longae, 2.3–4 mm. latae.—Caules 1.4–2.35 cm. longi.—Foliorum petiolus 2–3.5 mm. longus, 1.3–1.9 mm. latus; lamina 8–9 mm. longa, 4–5.9 mm. lata.—Calycis pars concreta 0.9–1.25 mm. longa; pars libera 2.5–3.5 mm. longa, 1.15–1.9 mm. lata.—Corollae pars concreta inconspicua; pars libera 2.5–2.75 mm. longa, 1.4–1.7 mm. lata.—Carpellum pars concreta 0.8–1 mm. longa; pars libera 2.8–3.2 mm. longa.—Styli 0.9 mm. longi.—Squamae 0.6–0.85 mm. longae, 0.4–0.6 mm. latae.—Semina 0.85 mm. longa, 0.5 mm. lata.

TIBET. *King* 318.

Obs.—*S. Stapfii* a *S. Karpelesae*, *R. Hamet*,* *S. Levii*, *R. Hamet*† et *S. Praini*, *R. Hamet*,‡ quibus affinis, valde distincta est.

* *R. Hamet*, Sur un nouveau *Sedum* du Tibet, in *Bull. Soc. Bot. France*, t. lviij, p. 615–617 (1911).

† *R. Hamet*, *Sedum Praini*, *S. Levii*, *S. Liciae*, in *Bull. Soc. Bot. France*, t. lvi, p. 567–568 (1909).

‡ *R. Hamet*, l. c., p. 565–567 (1909).

A. S. Karpelesae: 1° gemmulae squamis non foliiformibus; 2° foliis in solo verticillo aggregatis; et non subverticillatis in caulis parte superiore; 3° sepalis corolla paulo longioribus vel paulo brevioribus, et non corolla multo brevioribus; 4° petalis marginibus erosis, et non integerrimis, differt.

De *S. Levii*: 1° gemmulae squamis non foliiformibus; 2° foliis in solo verticillo aggregatis, et non alternis; 3° sepalis lineari-deltoideis vel deltoideis, obtusiusculis vel obtusis, et non late ovatis, acutis; 4° petalis marginibus erosis et non integris, discrepat.

A. S. Praini: 1° foliis in solo verticillo aggregatis, et non in caulis parte superiore subverticillatis et alternis; 2° caule unifloro vel ramis unifloris, et non caule ab inflorescentia corymbiformi terminato; 3° sepalis lineari-deltoideis, vel deltoideis, obtusiusculis vel obtusis, et non ovatis, acutis; 4° petalis marginibus erosis, et non integris, distat.

Denique ab his 3 speciebus dioecia abest.

Sedum Rendlei, *R. Hamet*, sp. nova.—*Planta* perennis. *Radices* crassiusculae. *Caudex* brevis, carnosulus, repens, apice suberectus, caulem floriferum basi squamis late semiorbicularibus obtusis cinctum, et squamarum ovatarum obtusiuscularum gemmulam apice ferens. *Caules* floriferi erecti; graciles, simplices, glabri. *Folia* alterna, sessilia, infra insertionem in calcar non producta, glabra, oblonga vel oblongo-linearia, vel sublinearia, apice acutiuscula, marginibus integerrimis, longiora quam latiora. *Inflorescentia* flore solitario, vel floribus paucis (3–5) in pseudo-umbellam dispositis. *Bractee* foliis similes. *Pedicelli* quam calyx breviores, glabri. *Calyx* glaber, segmentis 5 tubo longioribus infra insertionem in calcar non productis, longissime deltoideis, marginibus integerrimis, apice acutiusculis, longioribus quam latioribus. *Corolla* glabra, calyce longior, segmentis 5 tubo multo longioribus latissime linearibus basi leviter coartatis, in parte superiore longe attenuatis usque ad apicem acutiusculum et longe aristatum, arista petali apicem superante, marginibus integerrimis in parte lineari fimbriatis in parte superiore attenuata, longioribus quam latioribus. *Stamina* 10; filamenta oppositipetala infra corollae medium inserta, gracilia, sublinearia; antherae oppositipetales anguste reniformes, apice breviter cuspidatae, longiores quam latiores, corollae medium superantes. *Carpella* 5, multiovulata, glabra, in stylos quam carpella breviores, attenuata. *Squamae* 5, late quadratae, marginibus integerrimis, apice obtusissimis raro emarginatis, latiores quam longiores. *Folliculi* 5, multiseminati, erecti; lateribus internis non gibbosis. *Semina* oblonga, testa e rugis in longitudinem dispositis prominulis instructa, duabus extremitatibus nucleum vix superante.

Gemmulae squamae 2.9–4 mm. longae, 3.6–4.7 mm. latae.—Caules floriferi 6–8 cm. longi.—Folia 0.6–1 cm. longa, 0.9–1.45 mm. lata.—Inflorescentia 0.9–1.2 cm. longa, 1.1–2.3 cm. lata.—Pedicelli 1–2 mm. longi.—Calycis pars concreta 0.5–0.6 mm. longa; pars libera 8.2–8.9 mm. longa, 1.2–1.5 mm. lata. Corollae pars concreta 0.5–0.6 mm. longa; pars libera 8.2–8.9 mm. longa, 2.6–3 mm. lata.—Staminum alternipetalorum filamentorum pars concreta 0.5–0.6 mm. longa; pars libera 5.2–5.4 mm. longa, 0.45–0.5 mm. lata.—

Staminum oppositipetalorum filamentorum pars concreta 3·2–3·6 mm. longa; pars libera 2·9–3·2 mm. longa, 0·3–0·37 mm. lata.—Antherae 0·8 mm. longae, 0·5 mm. latae.—Carpellorum pars concreta 1·2–1·25 mm. longa; pars libera 4·8–5 mm. longa.—Styli 1·2–1·5 mm. longi.—Squamae 1·2–1·5 mm. longae.—Semina 1–6 mm. longa, 0·5 mm. lata.

WESTERN CHINA, 12,500 ft.; base rocks, *E. H. Wilson* 3619 in Herb. Brit. Mus.

Obs.—Planta, supra descripta, a *S. linearifolio*, Royle,* *S. dumuloso*, Franchet,† *S. Liciae*, R. Hamet‡ et *S. Hobsonii*, Prain,§ quibus affinis est, facile discreta est.

De *S. linearifolio*, petalis acutiusculis, longe aristatis, et non obtusiusculis, vix mucronatis, discrepat.

A *S. dumuloso*: 1° caudice graciliore, repente, et non ascendente, caulibus vetulis cincto; 2° petalis magis fimbriatis, differt.

A *S. Liciae*: 1° foliis sessilibus, oblongis, vel oblongo-linearibus, vel linearibus, apice acutiusculis, marginibus integerrimis, et non petiolatis, lamina orbiculari, crenata, obtusissima; 2° petalis latissime linearibus, basi leviter coartatis, in parte superiore longe attenuatis, marginibus in parte superiore fimbriatis, et non ovato-lanceolatis, marginibus integris, distat.

A *S. Hobsonii*: 1° caudice repente, nudo, et non erecto, caulibus floriferis vetulis et desiccatis cincto; 2° foliis oblongis, vel oblongo-linearibus, vel linearibus, et non ovatis; 3° sepalis acutiusculis, et non acutis; 4° petalis marginibus fimbriatis, et non integerrimis, abest.

XXIV.—MISCELLANEOUS NOTES.

MR. W. B. HEMSLEY. We note with pleasure that Mr. W. B. Hemsley, F.R.S., late Keeper of the Herbarium, Royal Botanic Gardens, Kew, has received the Honorary Degree of LL.D. from the University of Aberdeen. He has also been elected an Honorary Member of the New Zealand Institute.

MR. J. MEDLEY WOOD. It gives us particular pleasure to record that Mr. J. Medley Wood, the veteran Director of the Natal Botanic Gardens, has had the Honorary Degree of D.Sc. conferred upon him by the University of the Cape of Good Hope.

* Royle, *Illustr. Bot. Himal.*, p. 222, tab. xlviii., fig. 1.

† Franchet, *Plantae David.*, t. i., p. 129 (1884).

‡ Hamet, *Sedum Praini*, *S. Levii*, *S. Liciae*, in *Bull. Soc. Bot. France*, t. lvi., p. 568–570 (1909).

§ Prain, ex Hamet, *cf. supra*.

A New Rot of Potato Tubers.—A new disease of potatoes, which was notified from Ireland last year, has now been described in detail by Dr. G. H. Pethybridge.* It was first observed in 1909 in the plots of the temporary experiment station, established by the Irish Department of Agriculture, at Clifden, Co. Galway. Since then it has been kept under observation, and has also been received from other parts of Ireland. The rotting is found to be due to a fungus closely allied to *Phytophthora infestans*, but differing in certain essential particulars. The fungus is named *P. erythroseptica*, and for the disease the name "Pink Rot" is suggested, owing to the cut surfaces of affected tubers quickly turning pink when exposed to the air.

The facilities afforded by the Clifden station give Dr. Pethybridge exceptional opportunities for studying potato diseases, and in the opening part of his paper he briefly but critically reviews the principal forms of tuber-destruction caused by vegetable organisms. The potato tuber is a structure on which, when once it has been injured, a most varied micro-flora and fauna readily develop, hence the diagnosis of the cause of decay is exceptionally difficult.

Pink Rot commences when the potatoes are still in the ground, and has been found in some varieties as early as July. In most cases the attack begins at the "heel" end of the tuber, and proceeds rather quickly towards the distal or "rose" end. Diseased tubers remain firm, but if pressed exude a quantity of juice, and finally become completely rotten. They do not, however, develop cavities, as in the case of Black Stalk Rot caused by *Bacillus melanogenes*. If the tubers are exposed to the air, the subsequent stages resemble those of a "dry" rot; but if covered, the moisture which is exuded does not dry up, so that in the field or store the rot would be regarded as of the "wet" type. A characteristic series of colour-changes takes place when affected tubers are cut open and exposed to the air. The pink colour begins to show after a few minutes, and within half an hour the whole of the diseased portion becomes a deep salmon-pink. With an exposure of several hours the cut surface gradually darkens, and becomes purplish-brown or nearly black. As pointed out above a number of other fungi develop on such decaying tubers, and pustules of various kinds, including those of *Fusarium*, break through the skin. The latter are merely secondary, the organism causing the initial injury being entirely internal.

Examined with the microscope diseased tissues show an abundance of rather wide, much branched, intercellular hyphae. No haustoria were observed, and no reproductive organs of any sort could be discovered.

With suitable precautions the fungus was isolated without difficulty, it being found to grow more easily on artificial media than its ally *P. infestans*. A full account of the culture media and methods is given, and also of the experiments which prove the pathogenic character of the fungus. Reproductive organs were produced abundantly in artificial cultures, though strong predilections for

* On the Rotting of Potato Tubers by a New Species of *Phytophthora* having a Method of Sexual Reproduction hitherto undescribed. Sci. Proc. Roy. Dubl. Soc., vol. xiii, no. 35, March, 1913.

certain substrata were shown. Growth on various media derived from oats was specially vigorous, and an abundant crop of sexual organs follows, from which oospores develop. An acid medium appears to be unfavourable for the production of antheridia and oogonia. Conidia were produced when pieces of culture were transplanted to sterilised peat-bog water or even rain-water; these structures are apparently only developed under water and very rarely if ever on aerial mycelium.

The method of development of the apparently sexually produced oospores is remarkable and unique amongst fungi. The oogonium incept enters the antheridium at or near its base, grows up through it and out at the top, expanding there to form the oogonium proper in which the oospore develops. Cytological details are not yet available. At the end of the paper other species of the same genus are shown to behave in a similar manner, and some systematic alterations based on this discovery are proposed.

Phytophthora erythroseptica is prevalent in the West of Ireland, and the losses caused by it are considerable, in some cases heavier than those due to *P. infestans*. They are greatest in crops grown continuously on the same land (infection taking place from the soil) and can be avoided by proper rotation.

A.D.C.

Salacia Livingstonii.—Under this name Dr. Th. Loesener has described a specimen in the Stockholm Herbarium labelled "Livingstone's S. African Exp. 14-19 S. Lat. Coll. Dr. J. Kirk." Whilst arranging the African material of *Salacia* at Kew in accordance with Loesener's revision, it was found the description of *S. Livingstonii* fitted the type specimen of *S. pyriformis*, var. *obtusa*, Oliv., which was collected by Kirk on Livingstone's expedition, and which had not been seen by Loesener. The synonymy and distribution of the species are as follows:—

Salacia Livingstonii, Loes. in Engl. Jahrb. vol. xlv. p. 178 (1910). *S. pyriformis*, var. *obtusa*, Oliv. Fl. Trop. Afr. vol. i. p. 375 (1868).

PORTUGUESE EAST AFRICA. Lower Zambesi: Shupanga, Kirk. Shire River: Shamo, Kirk.

T. A. S.

Botanical Magazine for March.—The plants figured are *Cytisus Dallimorei*, Rolfe (t. 8482); *Magnolia salicifolia*, Maxim. (t. 8483); *Aloe Marlothii*, Berger (t. 8484); *Ruellia Harveyana*, Stapf (t. 8485); and *Prunus pennsylvanica*, Linn. f. (t. 8486).

Cytisus Dallimorei is a garden hybrid obtained at Kew by crossing the well-known *C. scoparius*, Link, var. *Andreanus*, Hort. with *C. albus*, Linn., the former being the seed-bearer, and it is interesting that this exceedingly attractive plant is the first artificial hybrid obtained in the genus. Its flowers which are produced with great freedom are coloured with various shades of rosy-purple, thus differing markedly from those of both parents. Only two seedlings were raised from the original cross and in one of these the flowers were yellow. A seedling obtained from the yellow-flowered plant has cream-coloured flowers touched with rose.

The *Magnolia* is a Japanese species distinguished among the species in cultivation by its slender twigs and thin narrow leaves. Its flowers resemble those of *M. stellata*, Maxim. in which, however, all the segments of the perianth are petaloid, while in *M. salicifolia* there is a distinct calyx of three greenish-white sepals. The plant from which the material for the figure was obtained is one of a number purchased for Kew from a Japanese nursery in 1906.

Aloe Marlothii, recorded from Bechuanaland, Natal and the Transvaal, proves to be identical with a plant which had previously been named *A. supralaevis*, β *Hanburii*, Baker, from material received from the late Sir Thomas Hanbury's garden at La Mortola, where also the plant which furnished the specimen figured is in cultivation. The affinities of *A. Marlothii* are with *A. Galpinii*, Baker, from which it may be distinguished by the leaves being spiny-tuberculate beneath, and by the yellow, not red, somewhat longer second flowers.

Ruellia Harveyana is a new species which was discovered by Mr. J. C. Harvey of Sanborn, Vera Cruz, in forests on the Atlantic side of the Isthmus of Tehuantepec, Mexico, in 1904. The plate was prepared from a plant which was received from Mr. Harvey in 1911 and which flowered in August, 1912. It has petiolate oblong or elliptic-oblong leaves, 2-3 inches long, and rather large pale lilac sessile flowers, produced one at a time in the upper axils. It is most nearly allied to *R. lactea*, Cav.

The *Prunus* is an old but still not familiar species in English gardens. A small tree presented to Kew by the Arnold Arboretum in 1910 has flowered very freely, and it is suggested that the species would be worth a place in thin woodland where *P. avium* and *P. Padus* succeed. *P. pennsylvanica* is widely distributed in North America, ranging from Newfoundland and the shores of Hudson's Bay in the north to North Carolina and Tennessee in the south, and westward to the inland slopes of the Rocky Mountains.

Botanical Magazine for April.—The plants figured are *Sansevieria aethiopica*, Thunb. (t. 8487); *Pyrus ionensis*, L. H. Bailey (t. 8488); *Cocculus trilobus*, DC. (t. 8489); *Cistus Loreti*, Rouy. & Fouc. (t. 8490); and *Hypericum Kalmianum*, Linn. (t. 8491).

The *Sansevieria*, a species widely distributed in South Africa, has been known in European gardens for upwards of a century, but, owing to its having been mistaken for *S. zeylanica*, Willd., it has not previously been figured under its correct name. The plant from which the material for the figure was obtained was sent to Kew in 1895 by Mr. C. Howlett, Curator of the Botanic Garden at Graaf Reinet. With regard to *S. zeylanica* it is of considerable interest that wild specimens have recently been received at Kew from Ceylon and prove that the species is quite distinct from that usually known by the name.

Pyrus ionensis is the Common Crab of the Mississippi basin and belongs to a small group which includes the closely allied *P. coronaria*, Linn., distinguishable from the species now figured by having its leaves truncate or slightly cordate, and, when mature, nearly or quite glabrous. *P. ionensis*, like *P. coronaria* and

P. angustifolia, Ait., is remarkable in having violet-scented flowers. A double-flowered form of *P. ionensis* is often met with in gardens usually either as *P. angustifolia*, *flore pleno* or as *P. coronaria*, *flore pleno*.

Cocculus trilobus was introduced to cultivation from Japan about twenty years ago by Professor Sargent of the Arnold Arboretum. It is a hardy scandent shrub with insignificant flowers but rather attractive bunches of small blue-black fruits. The species ranges from Japan and Northern China to the Philippines.

Cistus Loreti is a hybrid between *C. ladaniferus*, Linn. and *C. monspeliensis*, Linn., which has been found in a wild state in Hérault, growing with the two species named, and has since been obtained artificially by the late Dr. Bornet. It has been grown at Kew for a quarter of a century and has proved of great value owing to its hardiness.

The pretty *Hypericum Kalmianum* was originally introduced into this country in 1759, but it appears for some years past to have been lost to gardens, the plant commonly grown under its name being *H. prolificum*, Linn. Seeds of *H. Kalmianum*, which is a native of the Great Lake region of North-Eastern America, were received at Kew in March, 1911, from Mr. J. Dunbar, the Assistant Superintendent of the Rochester Parks, N.Y. The figure was prepared from a plant, raised from these seeds, which flowered in August, 1912.

Agricultural Chemistry.*—The issue of the 3rd edition of this admirable work (the 1st appeared in 1902) affords a gratifying evidence that the scientific and theoretical aspect of agriculture is becoming a matter of more general study among those concerned. We know no work better calculated than this to give the student of advanced agriculture a thorough appreciation of the underlying principles that should govern the management of crops, the application of manures, the respective values of different foods for farm animals, and farm-work generally. It is on chemical change that agriculture has its ultimate foundation, and it is on its control and most beneficial adaptation to his own purposes that the success of the farmer depends. The work opens with a description of the more important elements, gaseous and solid, and a general discussion on their connection with plant and animal life. The atmosphere and soil are then dealt with, leading up to a study of plant structure and physiology, crops and manures. The second part of the work is largely devoted to agricultural animals, their foods and feeding, milk and milk products.

Mr. Ingle's book is one of great value and interest and should be in the hands of all who desire a deeper knowledge of the workings of plant and animal life in relation to what is still the most important of all industries. It brings together a remarkable assemblage of facts of the highest importance to farmers stated in clear, concise language intelligible to persons of average education.

* *Manual of Agricultural Chemistry*. By Herbert Ingle, B.Sc. (Leeds) etc. London, Scott, Greenwood & Son, pp. 397; 16 illustrations; price 7s. 6d. net. 3rd edition, 1913.



CORYLUS JACQUEMONTII.